LIBRARY
DEC 4 1893

THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME LIX.—No. 23. Whole No. 965. | NEW YORK, MONDAY, DECEMBER 4, 1893. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
JOS. R. THOMAS, C.E., Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND CLASS MATTER.

Published on each Monday of the year, at No. 32 Pine Street, N. Y.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European countries, $4.50 (19 shillings—22½ francs). All payments to be made in advance. Single copies, 10 cents.

Remittances should be made either by post-office order, express money order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

Collections are invariably made directly from this office, for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

The American News Company, Nos. 39 and 41 Chambers street, New York, are agents for this JOURNAL. Newsdealers will send orders to them.

Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

Books.—We will forward by express, at publisher's lowest rates, any book—scientific or otherwise—to any address in the United States or Canada. We would suggest to our patrons that to avoid the risk and expense consequent on sending us the money (we do not send books C.O.D.), that orders for books be sent us through the Purchasing Department of the American Express Company.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICE—
Annual Meeting, Society of Gas Lighting..... 793
EDITORIALS—
Briefly Told 793
The State of Trade—The Proposed Sale of the Philadelphia Gas Works—Measurement of Electric Currents.
Gas in the Kitchen..... 794
*Models for Illustrating the Relationship between Gas Volumes and Molecular Weights, by Mr. W. Simon..... 793
*Appendix to the Paper on Gas Engines in the American Market, Read by Mr. F. H. Shelton before the American Gas Light Association—Concluded from Page 767..... 797
New Incandescent Arc Lamps..... 801
Explosion as Proximate Cause of Loss: Explosion as Fire Loss..... 802
ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 803
Rate War in the Annexed District—Annual Report, Consumers Company, Toronto—Annual Meeting, Ogdensburgh, N. Y.—Ordinance Proposing the Sale of the Philadelphia Works—High Priced Incandescent Lighting—Annual Meeting, Gilroy, Cal.—Will Not Sell the Lowell Works—Dollar Gas for the Roxbury (Mass.) District—Unprofitable Incandescent Electric Lighting Rates—Foreclosure Sale, Middleboro (Mass.) Gas and Electric Company—Sued the Watertown (Mass.) Company—Improvements at Davenport, Ia.—Still Haggling Over the San Francisco Gas Rate—Organizing the Board of Gas Trustees, Wheeling, West Va.—Col. Wheelwright Named as Chairman of the Massachusetts Commission—And Many Other Items.
Incandescent Gas Lighting..... 805
The Market for Gas Securities 806

[OFFICIAL NOTICE.]

Annual Meeting, Society of Gas Lighting.

OFFICE OF THE SECRETARY, December 1, 1893.

The Nineteenth Annual Meeting of the Society will be held in the city of New York, at the works of the Consolidated Gas Company, 18th street station, on Thursday, December 14th, at 3 o'clock, P.M.

FRED. S. BENSON, Secretary.

BRIEFLY TOLD.

THE STATE OF TRADE.—The unwelcome conviction—and a conviction of any sort is usually of the unwelcome type—is forced upon us that the times are more than passing hard; that what we had hoped last spring and summer would fade out with the approach of fall is still a stern and vivid reality. And the situation becomes all the more uncomfortable when one considers that we stand on the sill of a winter season which the weatherwise make bold to predict is to be of exceptional severity. Severe or not, as to the atmospheric conditions, would make trifling difference were the wheels of industry moving swiftly over the grooves that we of this country have been used to in our commercial ways for some years past, for in such event the workman and the master could protect himself, each in his way, from winter's cold and blows. But as the wheels are slow and eccentric in their turning, the workman fears and the master is perplexed. As it is with other industries, so it is with the artificial lighting industry and in all the branches thereof. The gas man, the electrician, the seller of oil, the moulder of candles—each feels keenly the depression that rules in our commerce. We can speak with authority regarding the gas output of the country, for our visitors and our correspondents have the same story to tell of decreased output, that can be traced to a falling off of the consumption of gas in the mill, the factory, the shop and the home. In every State is this so; nor is the loss greater in the small town than in the large city, proportionately. The ratio of decrease, too, seems to be remarkably even. We do not mean to say by this that the output of to day is markedly less than it was a year ago—the absolute losses are exceptional, comparing the sendout of November, 1893, with that of November, 1892—but we do not find any sensible gains reported. For the past five years, in which we have fairly well succeeded in keeping track of the gas business of the country, the normal rate of expansion in gas output may be put at 9 per cent., and this seems to have been about wiped out. In other words, the business seems to be stationary. Perhaps in the knowledge that we have not receded, comfort may be gained, nevertheless the painful certainty exists that we have not gone ahead. It is true that the past summer and fall were unusually unfavorable seasons from the standpoint of the gas manufacturer. Clear, bright, warm days were the rule, and while days of those types are eagerly welcomed and thoroughly enjoyed from a physical point of criticism, if we may so speak, they are not of the nature that brings the gasholder to its bed. However, we have much to be thankful for. If we have not taken a swift step forward, neither did we beat a sharp retreat, and in spite of the discouraging conditions, many of the Companies, with rare prudence and handsome courage, have made sensible reductions in their selling rates,

thus fortifying themselves against greater retrenchment on the part of their customers. Meanwhile all have done their duty in keeping close watch over the small economies, and to the credit of the workmen be it said they have shown an intelligent appreciation of the difficulties that environed their employers by performing their whole duty, even when asked to submit to a temporary though slight cut in their wages. In fact, we may without fear of successful contradiction say that in no other branch of trade and manufactures have the workmen shown a fidelity to their masters equal to that shown by the employees of gas works during this exceptional era of depression in our commerce.

THE PROPOSED SALE OF THE PHILADELPHIA GAS WORKS.—Elsewhere we report the text of an ordinance recently introduced in Philadelphia City Councils, by Mr. Cleaver, which proposes to authorize and direct the Mayor to dispose of the municipal gas works and everything pertaining thereto, to the highest bidder, in what we presume is intended to be a sealed competition. No doubt this will give a shock to the amateurs who insist that all enterprises which must seek the sanction of municipal authorization to engage in trade should be operated exclusively by and for municipal account; but they will be all the better for such shocking, in that a few good shakings up may ultimately show them that private enterprise can always be counted on to outdo public manipulation. Of course this idea of turning over to private control the gas works of Philadelphia is by no means a new proposition, since a similar proposal was made a few years ago, and with a very close approach to its consummation. We think, however, that Mr. Cleaver's minimum figure, about which a bid may be before it is considered worthy of being even looked at, is ridiculously low. He declares that no bid under $10,000,000 should be entertained, and certainly no one will disagree with him there. He is, however, something like 100 per cent. short of the mark, and we submit that if the Philadelphia exclusive gas supply, taking the works in their present condition, is not worth a minimum of $20,000,000, it is not worth anything. Even at $1.50 per 1,000 cubic feet the sendout for the current year will be not far from 4½ thousand millions, and if the rate were cut to $1 per 1,000 we have no doubt in five years' time the output would reach 6 thousand millions. Private enterprise knows full well the percentage of profit that such a business would yield at the selling rate named, and we are quite certain that if the Cleaver ordinance ever becomes law, the lowest bid submitted under it will not be a cent less than $25,000,000, and lucky would the purchaser be who secured the right and property at that seemingly round sum. Of course, the value of the whole would depend largely upon the nature and terms of the franchise that the city would vest its successor with; but private enterprise before it assumed the obligation would know to a dot just what it could and could not do.

MEASUREMENT OF ELECTRIC CURRENTS.—Now that the practice of charging users of electric current supplied to incandescent lamps on the basis of a meter registration is rather the rule than the exception, the electric companies are experiencing many of the trials and tribulations that have been (and occasionally are) the gas man's portion. No matter how rational a man may be in general, when it comes to the particular question of the reliability of a gas meter, seven out of every ten gas consumers are prone to go wide of reason; and this being the case, respecting an instrument that can be tried by simple mechanical rules, in front of the very senses of the one who doubts it, how much harder is the lot of the electrician, who has only a measurer of the makeshift order, and who can only ask "his doubter" to take the electrician's word for it that "the meter is all right," when he is called upon by the irate consumer? Some electricians, however, have taken the bull by the horns in instances of this nature, by claiming that the meter adopted is "the best that can be found in the present knowledge of the art or science of supplying electric currents," as witness the following forwarded us last week by a Philadelphia correspondent:

"Some days ago argument was heard in Court No. 1, Philadelphia, in a controversy over electric lights. The Edison Electric Light Company had brought an action against John G. R. McCorkell to recover $169.20 for electric lights furnished him. McCorkell's defence was that he was charged for electric current not used, and that the consumption or measurement of the current through the meter furnished by the Company was totally wrong; that the meter did not register correctly; that he was unable to state, by reason of the meter being defective, in what sum he was indebted to the Company, and had no opportunity to make a test by means of a new and correct meter. A rule was then taken for judgment for want of a sufficient affidavit of defence. It was contended for the Company that electric lighting, or the science of electricity, is in its infancy, that the Company had adopted a meter which was, in its best judgment, the best that could be found, and that the defense was insufficient because the affidavit did not set up in what respect, manner or particular the meter was incorrect, and that it gave no standard by which its correctness or incorrectness could be tested. The Court upheld this view, and ordered the entering of a judgment for want of a sufficient affidavit of defence."

Gas in the Kitchen.

[Translated for the JOURNAL from the *Journal des Usines a Gaz*, by Mr. Herman Poole.]

In a communication made to the General Assembly of Austro-Hungarian Gas Manufacturers, at Presbourg, Mr. Scheiwkhart summarizes the series of tests made by Mr. Buhe, Chief Engineer of the Continental Gas Company, last year, at Dessau, employing the cooking stoves made at that time in the shops of that Company. The following are some extracts from the notes on the subject:

In comparing the results of these trials, destined solely to throw light on the economy of gas employed for heating, with those obtained in 1885 by Engineer Coglievina, of Vienna, who simultaneously used gas and solid fuel, and by giving to these two series of trials, both absolutely independent, the same base—preparation of food for a family composed of seven or eight persons, with gas costing $1.40 per 1,000 feet—we obtain the figures given in Table No. 1. These figures are most instructive and can be easily verified at any time.

TABLE I.—*Morning Coffee.*

Coffee	.55 lbs.
One liter of milk	2.64 "
One liter of water, for coffee	2.20 "
Three liters of dish water	6.60 "
Total	11.99 lbs.

Expenses.

Wood	1.32 lbs., worth	.78 cents.
Coal	4.62 "	1.65 "
Together (wood and coal)		2.43 cents.
Gas	3.89 cubic feet	.53 cents.

Noonday Meal.

(a.) *Meat.*	
Beef	3.3 lbs.
Bone	.44 "
Vegetables	.36 "
Four and one half liters of water	9.90 "
(b.) *Rice Soup.*	
Two liters of stock	4.18 "
Rice	.55 "
(c.) *Vegetables.*	
Lentils	.83 "
Fat	.22 "
Flour	.11 "
Onions	.06 "
Water	3.30 "
(d.) *Roast.*	
Veal	3.30 "
Gravy	.22 "
(e.) Dish water	26.40 "
Total	53.17 lbs.

Expenses.

Wood	7.04 lbs	4.2 cents.
Coal	40.25 "	8.0 "
Together (wood and coal)		12.2 cents.
Gas	51.7 cubic feet	7.1 cents.

Afternoon Coffee.

Same as for morning coffee	11.99 lbs.

Expenses.

Wood and coal	2.43 cents.
Gas 3.89 cubic feet	.53 cents.

Supper.

(a.) *Meat.*	
Cutlets	2.2 lbs.
Pork chops	.55 "
Fat	
(b.) *Vegetables.*	
Picked cabbage	2.2 "
Three sausages	.55 "
Fat	.22 "
Liquor	1.54 "
Dish water	6.6 "
Total	13.86 lbs.

Expenses.

Wood	4.18 lbs., worth	2.5 cents.
Coal	13.64 "	4.7 "
Together (wood and coal)		7.2 cents.
Gas	18 cubic feet	2.5 cents.

Daily Expenses.

Wood	13.86 lbs	8.3 cents.
Coal	45.54 "	16.0 "
Together (wood and coal)		24.3 cents.
Gas	77.6 cubic feet	10.7 cents.

There results from the above table of figures that, in a residence of ordinary importance, cooking by means of wood and coal costs 24.3 cents daily, while this cost with gas amounts to only 10.7 cents. So that, even without speaking of the convenience and the most incomparable cleanliness which the use of illuminating gas presents, it has over solid fuel the advantage of making possible, even in the preparation of food alone, a monthly economy of about $4. But, adding to it the necessarily inevitable periodical expenses of the actual heating system, that is to say, frequent repairs of the stoves, regular cleaning of the chimney, etc., we are infalliby forced to the conclusion that we lose, without any utility, only for cooking, fuel to the amount of $48 annually.

Table II. shows the consumption of gas necessary for the preparation of food in smaller families, say five or six persons.

TABLE II.—*Morning Coffee.*

	Gas Burned.	Cost.
Water for the coffee, Water for the washing	3.89 cubic feet	.53 cents.

Dinner, at Noon.

	Gas Burned.	Cost.
2.2 lbs. beef, 2 pints vegetable soup, 2. 2 lbs. roast, Dish water, at 120° (3 hours' cooking)	24.6 cubic feet	3.34 cents.
Afternoon Coffee	3 89 "	.53 "

Supper.

1.6 quarts soup or tea, 1.6 " dish water	3.89 cubic feet.	.53 cents.
To even up the figures	.73 "	.12 "
Total per diem	37.00 cubic feet.	5.02 cents.
Total per month	1,110 "	$15.00

According to the experiments made for several years by the municipal works at Leipzic, a consumption of 700 cubic feet per month, at a cost of 98 cents, is sufficient for families composed of three or four persons, for preparing all the ordinary food during the space of one month. It has even been asserted that a relatively large number of housekeepers are thus able in a measure to dispense with servants employed formerly in the kitchens, or use their time otherwise and solely for heavy work, and paying consequently much less wages. As experience proves it daily, the employment of solid fuel is limited, above all in the great centers, to the preparation of large meals, and we use other sources of heat to attend to other portions of the housekeeping.

It is to be regretted that we have come to these later days to employ for this usage, to the great detriment of the public security and of economy, liquid fuel, such as benzine, alcohol and kerosene. We should strike from the list all those whose use has already cost human lives and destruction of property, and keep exact record of the cost of light and heat by means of liquid fuel. We would then see that there is no proportion between the dangers incurred and the results obtained and the expense involved. In effect, let us frame some opinion from what takes place at Vienna, for example, where there passes hardly a week without the daily papers having recorded such or such an accident, resulting from cases where people have, through the careless use of alcohol or kerosene, been injured and even killed; and then let us go on to the question of cost. We will be forcibly led to conclude, taking facts given us by competent authorities, that cooking done with liquid fuel, about which experience proves that persons in less than easy circumstances show the strongest predilection, is incomparably much more costly than cooking by gas. This fact is established in the most convincing manner by the figures of table III., which contains the average of a large series of experiments. It shows the quantities of the different fuels needed to raise the temperature of a liter of water from 55° to 212°:

TABLE III.

Fuel.	Minutes.	Quantity.	Price per Unit.	Cost.	Ratio of Cost.
Gas	11	1.13 cu. ft.	$1.40 per M.	0.16	100
Benzine	32	308.6 grs.	5½c. " lb.	0.24	156
Kerosene	28	453. "	4½c. " "	0.29	188
Alcohol	14	.95 oz.	1.15 " gal.	0.80	531

From these figures, we see, that in round numbers, and for equal calorific effect, gas is one and a half times cheaper than benzine, nearly two times less expensive than kerosene, and at least five times cheaper than alcohol.

But all these advantages, incontestable since they may be demonstrated by calculation, are counterbalanced, we must say, on one side by the unfortunately too widespread and, as we believe, utterly erroneous idea, according to which all food prepared by gas has a disagreeable after-taste, and, on the other side, by the prejudice, also as completely unjustified, by which the system of heating in question is inevitably accompanied by a disengagement of gas, the odor of which may be perceived and which should have a harmful influence from a hygienic point of view.

This discredit must be attributed to the manner in which the small gas stoves work, which have been adopted, even by us, in quite large numbers, in consideration of the economy claimed for them, but which in reality have only furnished practical results of little satisfaction. But, after having examined the question a little deeper, and, above all, with less prejudice, we will be certainly and infallibly led to the conviction that the adoption of the apparatus in question should be put solely to the charge against the consumer who employed generally for all uses an apparatus which has been constructed for a single determined use. The examination of the following case, cited as example, but which is often reproduced in actual practice, proves this completely. Let us suppose it is deemed necessary to put up a heating stove in a certain portion of a building. As there is no chimney, and the construction of one must be cheap and presents numerous difficulties, it is decided to put in a gas stove, this producing no smoke and consequently requiring no chimney. In brief, a gas heater is procured without any further information. But, in a short time, after having put it in use, they become convinced, unfortunately, that the heater in question, while satisfying from point of cheapness in first cost and in consumption, leaves much to be desired when viewed from a working point, and, above all, from the point of respirable air. It brings most of the time violent headaches; a short time later, sickness of all kinds, and even finally fainting. These ill effects become so pronounced that in a short time the stove, which has deceived by so great hopes, is relegated to the box of debris with the rest of the old iron.

Why has this heater failed so completely? Just simply from not having taken account of the fact that a combustion of gas is necessary in the furnace heater to produce the heat. This cannot happen without the changes that ensue upon the conversion of the live gases into carbonic acid, to the detriment of the oxygen contained in the air. Now, the inhaling of carbonic acid gas should produce infallibly the dangerous symptoms of which complaint is made. The products of combustion are, in this case, without doubt invisible, and it is, therefore, that we should at first be careful to have a chimney to carry them off, which should be higher than the house and designed to purify the neighborhood, as we do in the case of combustion of solid fuel which burns with a smoke. But these irrespirable and hurtful products exist in it, and it is hence absolutely necessary to cause them to escape under all circumstances, and by the shortest way, to the outside air. If the gas heater did not fill the desired end it was not the fault of the apparatus itself, but solely to lack of reflection and to appropriateness with those by whom it was put in. If we put it in communication with the air by means of a simple pipe which, without regard to locality, does not injure the neighborhood at all, and provide a sufficient supply of fresh air, we will have at our service in the room a healthy atmosphere, quickly and cheaply heated, the temperature easily and surely regulated and at any moment, which may be also produced quickly and economically and also more cheaply than by any other system of heating.

But does not heating by gas bring also certain dangers? That is a question which, presented in this form, needs at first an affirmative reply. The accidents of gas are produced often enough, whether in the form of asphyxiation, or in the shape of explosions, and prove that illuminating gas may have dangerous action, as in general all fuel, which, to employ an expression well known in poetry, "breaks its chains."

But man may, in all time, "domesticate and survey" heating by illuminating gas in a manner incomparably much more easily and sure than belongs to any other system of heating, and, consequently, to use it as a celestial force truly beneficent. For, on one side, and without exception, all the other fuels used to-day imply a constant danger from the time that they arrive in our dwellings, by reason that the manner in which they are kept renders completely impossible all methods of absolute protection. Illuminating gas, on the contrary, which is contained in conduits, absolutely protected from the incendiary, may become dangerous only at the moment when it passes into the air in a state of non combustion, forming with it a mixture of air and gas of a composition perfectly known, called detonating gas, and then comes in contact with a naked flame. On the contrary, while the conduit in question remains intact, which we may assure ourselves of at any time and in a very simple way, the stop-cock is opened only at the instant we wish to use it, and the gas at the moment it arrives in the air betrays its presence by its characteristic and penetrating odor, is employed at the point of its destination, it absolutely never brings a danger of that kind.

From all these considerations, it appears absolutely safe to affirm that illuminating gas employed for heat and cooking unites all the advantages which we may rightly expect of a fuel which may be employed at all times in a sure manner and with neatness and economy.

These many advantages may be recalled and condensed briefly in saying:

1. Gas is available at all hours of the day at its place of destination, at a price always the same, which avoids the carriage and laborious breaking of wood or coal, as well as putting them in the cellar, and allows economy in the place of location of the cellar and loss of money from change of market rates.

2. As the cellar is not employed, and as we do not need to store it in close proximity to the cook stove, the stocks of fuel necessary for the daily needs and the risk of fire in the interior of dwellings are very much diminished.

3. Heating by gas develops its total calorific power at the instant we light the gas in the stove. Lighting fire, a tiresome and long operation with liquid fuel, and above all very dangerous, is thus supplanted and work needed for heat is effected each time in the shortest possible space of time.

4. The consumption of gas may at any moment be augmented or diminished according to special wants. The inevitable morning raking of the fire, and consequent loss of time in removing the cooking utensels, is thus suppressed.

5. The consumption of gas, once determined, may be then surely kept within fixed limits, and it is always exactly controlled by the meter.

6. The gas may be as advantageously utilized in small stoves as in large ones, in the same manner that these latter ones may be supplied with the quantity exactly proportioned to the importance of the work furnished.

7. The employment of gas for cooking does away with all risk of burning the food, for each jet may always be turned down at will.

8. The radiated heat furnished by cooking with gas may be efficaciously utilized in winter to heat the kitchen, and may be almost completely avoided in summer.

9. The property of directing absolutely the heat from the gas flame, and in consequence to regulate at will the quantity of heat, preserves wonderfully the savor of the food.

10. Finally, gas heating produces no smoke, while all kinds of inconveniences inherent to the employment of solid fuels are obviated.

Models for Illustrating the Relationship Between Gas Volumes and Molecular Weights.

By Mr. W. Simon.

The difficulty experienced by students in fully comprehending the laws of Gay Lussac, and the hypothesis of Avogadro, has led the author to the use of object lessons in his lectures. The particular models herein described are intended to represent atoms and molecules, each atom possessing a definite weight, but a changeable volume. By means of these may be illustrated the alterations which occur in the volume of gases when they undergo chemical change; as well as the relations existing among those volumes, and among their molecular weights.

The models may be described as follows:

To a circular metallic frame (Fig. 1) of 5 centimeters diameter, formed of two semi-circular pieces joined by hinges, is fastened a hemisphere of cloth or leather, arranged in folds like an accordion bellows. The frames are provided with locks which permit the joining together of two (or more) hemispheres, as shown in Fig. 2. Two or more hemispheres form a spherical molecule. By using various materials in constructing the frames, the hemispheres are made to correspond to the atomic weights of the different elemen's, which latter a characteristic color serves to distinguish. Thus a black hemisphere, representing carbon, weighs 12 times as much, and a green one, representing chlorine, 35 times as much as a pale blue hydrogen hemisphere.

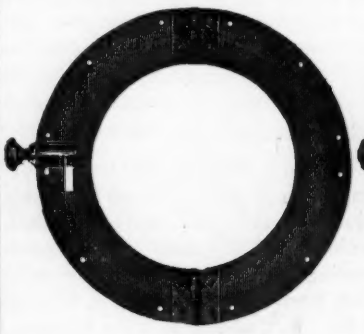


Fig. 1.

Fig. 2.

To illustrate the changes which take place when hydrogen and oxygen combine to form water: Two glass cylinders of 5 cm. diameter and 20 cm. high are filled with hydrogen molecules, and a like cylinder is filled with oxygen molecules. The condensation to two volumes is effected by joining an oxygen atom to each two atoms of hydrogen, forming a spherical molecule of water. The volumes should be weighed before and after condensation.

The writer begs to remind teachers that the use of the models should always be accompanied by an experiment with the gases themselves, and also to recall the necessity of impressing upon students the fact that the models are intended only to represent pictures (however distorted) of our conceptions of some chemical changes; and that they are not magnified illustrations of actual atoms and molecules.

Smoke-Prevention Legislation in Massachusetts.

The last Legislature of Massachusetts passed a law regulating the smoke nuisance in the large cities. This law provides that in cities of over 300,000 inhabitants, after July 1 of the present year, no person should "use bituminous coal for the purpose of making steam in boilers in any building, unless the furnace in which said coal is burned is so built or equipped that at least 75 per cent. of the smoke is consumed or otherwise prevented from entering the atmosphere, the degree of suppression being determined by the quantity of such smoke emitted, as shown by the density and color of the issuing smoke and the length of time which it is visible, the maximum standard of comparison being a continuous discharge of dense, dark smoke during the time the furnace is in active operation." The penalty was fixed at not less than $10 nor more than $100 for each week during which the violation of the law should continue.

Acting under this law the Mayor of Boston named the Superintendent of Streets as the official to be charged with the enforcement of the act, and the latter, in order to secure some ground on which to deal with the smoke nuisance, instituted a thorough system of inquiry throughout the city. Inspectors were instructed to see every factory and other business place where bituminous coal was used.

The investigation extended to a large number of items, including the time of erection of boilers, their number and size, as well as horse power, the area of heating surface and of chimney and smoke flues, the daily amount of coal burned and the number of hours in use of boiler, summer and winter, and any devices for smoke consumption in use or contemplated. Naturally, such an investigation, if properly conducted, could not be finished in one week or two weeks, and it has occupied nearly two months or more; but, as a result, a large amount of reliable information has been collected, and the Superintendent will soon be in a position to deal with any manufacturer who shows no disposition to comply with the law.

The State Street Horse Railway Company, of New Haven, Conn., has placed the contract for the roof of its new power house with the Berlin Iron Bridge Company, of East Berlin, Conn. The building will be 84 feet wide and 250 feet long, the roof trusses being of iron covered with slate.

[Concluded from page 767.]

Appendix to the Paper on Gas Engines in the American Market, Read by Mr. F. H. Shelton, before the American Gas Light Association.

The Foos.—This engine, made by the Foos Gas Engine Company, of Springfield, O., is a conventional form of the small vertical Otto cycle type, without radical special feature. It is designed to operate on either gas, gasoline or natural gas, and has electric ignition from an accompanying battery and a wiping electrode action somewhat similar to the "Union." The cylinder is placed above, and the general effect is that of a heavily built small steam engine. Two to one cog gears operate the

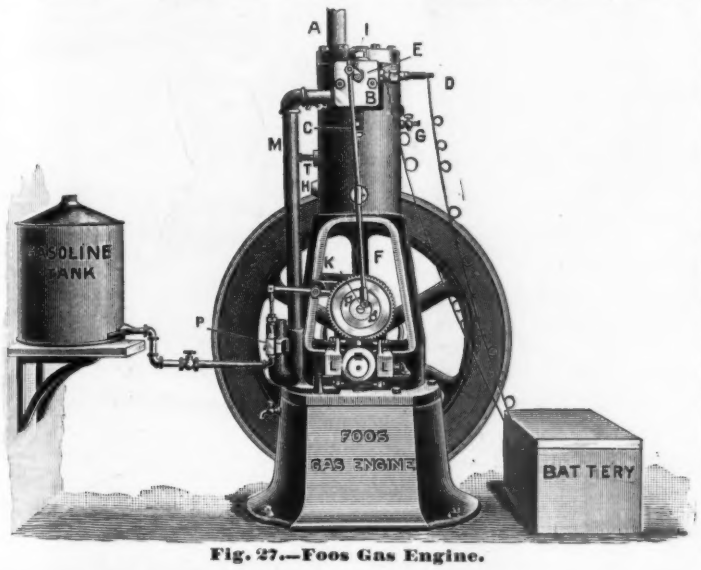


Fig. 27.—Foos Gas Engine.

igniting electrodes by a rod, and the exhaust valve by cam, via a rocker arm giving movements every other revolution as required. The valves are lifting spring poppet type. The upright form is catalogued from 1 to 10 actual H.P. The horizontal at from 4 to 25. The engine was evolved about 1890, and is now becoming more actively on the market. A detailed description is given in *Cassier's Magazine* for April, 1893.

The Daimler.—A somewhat unusual design mechanically in gas motors is shown in the Daimler, which is a German make, introduced into this country some two years or more ago by the Daimler Motor Company, of 111 East 14th street, New York. Two heavy crank discs within the inclosed case replace and serve as flywheels; the usual connecting rod and piston are within, acting upon the Otto cycle. On the side of one of the discs a cam-shaped double groove is provided, in which a small "follower" works connecting with an external rod giving the requisite motion to the gas exhaust valves. The governing of the engine is somewhat unusual. A ball governor within the belt pulley operates a sliding collar and suitable rod in such a way that the exhaust valve is thrown out of action and not opened. No escape of the waste gases is then possible and no new charge can enter until the exhaust is again in gear. This valve and the admission valve are of the spring lifting type. The ignition is by tube. A water jacket surrounds the upper end only of the somewhat long cylinder. In small sizes the motor is made with one or two cylinders. In 5 and 10 H.P. engines four are grouped together. The action in each is the same, but the cycles are so arranged as to give impulses in rotation, and hence greatest regularity of speed. This motor is adapted for gasoline, and is especially pushed in the field of small boats and launches. A full description may be found in *Cassier's Magazine* for August, 1893.

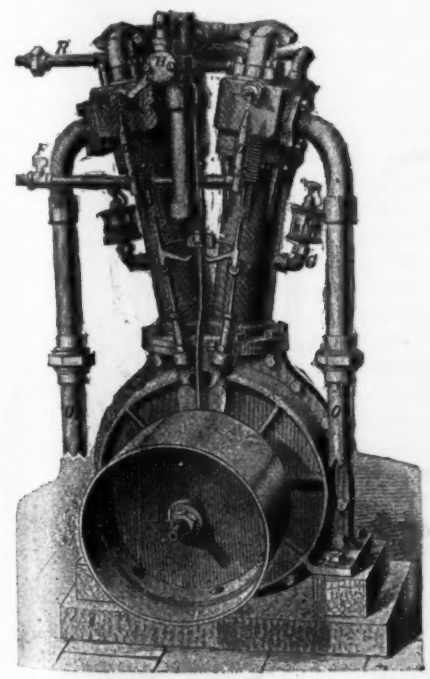


Fig. 28.—Daimler Gas Engine.

The Weber.—This engine is one of those that is pushed more for the use of gasoline than for city gas. As it is advertised for either, however, and manifestly is a gas motor for anyone who so cares to use it, it may properly be mentioned here.

It is made in Kansas City, Mo., by the Weber Gas and Gasoline Engine Company, of No. 407 S. W. Boulevard. Brought out in 1890 or '91, it closely resembles the Charter in appearance, being of the small, compact horizontal trunk piston, conventional Otto cycle type. The valves are poppet; the ignition by tube. The nearest thing to a distinctive feature is the encasing of the valve gear and governor, running the same oil in. The claim, too, is made that this "is the only engine in which the point of ignition is altered while engine is in operation, thereby effecting great saving." I fail to grasp the idea. Catalogue sizes run from 2 to 38 actual H.P.

The Witte.—This, also, is a Kansas City engine, practically similar to the preceding, as may be seen by a comparison of the cuts. It, too, is of the small horizontal trunk piston, Otto cycle class, with poppet valves and tube ignition; likewise it has so far been chiefly used on gasoline. I have been able to obtain no direct information or close decription of this engine beyond that given by an advertising circular; hence am unable to indicate any especially distinctive feature, and doubt if there is such in this motor. It is made by the Witte Iron Works Company, 1213 Walnut street, Kansas City, Mo., in catalogue sizes of 1 to 35 actual H.P.

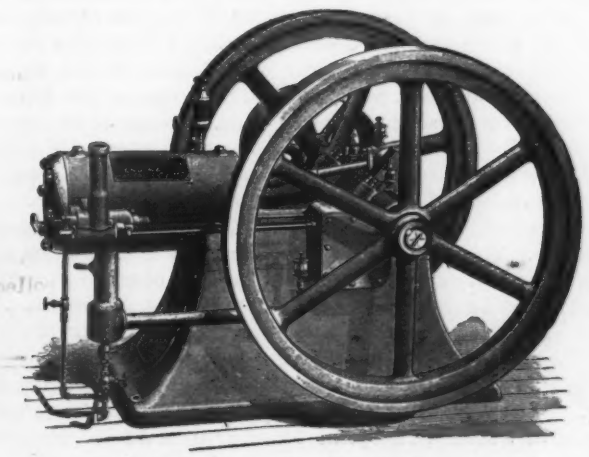


Fig. 29.—Weber Gas Engine.

The Safety Vapor.—The Safety Vapor engine, first appearing on the Pacific Slope in 1891, but now handled by the Safety Vapor Engine Co., of 16 Murray street, New York, is, as may be seen from the cut, one of the small conventional vertical type generally similar to the Foos and others.

The cycle is the Otto, with the cylinder above. The feature is a rotary disc or plate valve with but one opening in it, operated by a chain or link-belt from the shaft. This opening at the proper times in its rotation affords communication with the cylinder and the gas admission or the exhaust passages. Ignition is by electric battery and the use of a flexible electrode somewhat similar to the "Pacific" device.

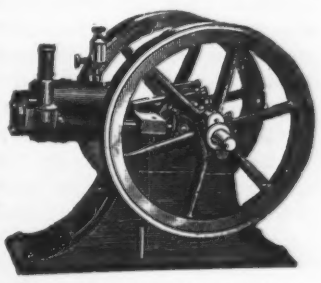


Fig. 30.—Witte Gas Engine.

It is claimed for the valve that its action is positive and simple; that it is self-cleaning and wears to a seat with no leakage. The governor acts by belt from the shaft, reducing the gas supply or omitting altogether, as may be required. The engine is built in sizes from ¼ to 6-H.P., and may be

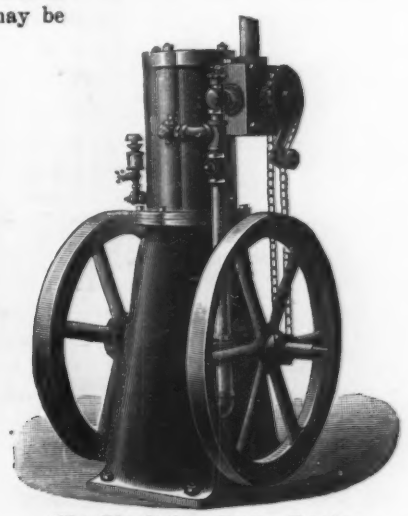


Fig. 31.—Safety Vapor Engine.

used on gasoline gas. It is especially pushed as a good motor for small boats. It has not an expensive make up and for many purposes should prove a satisfactory form. *Cassier's* for June, '93, further discusses it.

The Union.—The combination of the Pacific and Regan Companies, already mentioned, gave birth to the Union engine, as the resulting standard form for stationary motor work. Designed by Messrs. Daly and Barrett in '92, it is of horizontal type, from 6 to 25-H.P., using the Otto cycle and poppet valves. The electric ignition has a "wiping" action, operated not by a point on the piston, as in the Pacific, but by external cam driver rods and arms giving an oscillating motion to the electrodes to make and break contact. The governing in this engine and in the Pacific is by an action that, closing the admission, opens the exhaust, allowing the engine to run on free atmospheric pressure in the cylinder, until the gradual return to speed restores normal feed. This conduces to economy, as the minimum friction thus obtained enables the longest running before a fresh charge of gas is required. This engine is handled by the Globe Gas Engine Company, in the East, of 22 South 15th street, Philadelphia, and to summarize regarding this company, it may be said that it now controls the Regan, the Pacific and the Union forms of engines, under some 17 or more patents. The Regan form is no longer built. The "Pacific" covers small vertical powers and boat propulsion; the Union, the horizontal form for stationary ordinary motor purposes. All these engines use gas or gasoline as necessary, and the claim of the makers is that they put out an engine in efficiency and mechanical workmanship second to none. It is stated that a total of some 1,600 of the several forms above have been placed, aggregating 10,000 H.P., mostly, so far, in Pacific territory. The headquarters there are the Union Gas Engine Co., 221 First street, San Francisco. *Cassier's* for September and October, 1893, describes this engine and the Pacific.

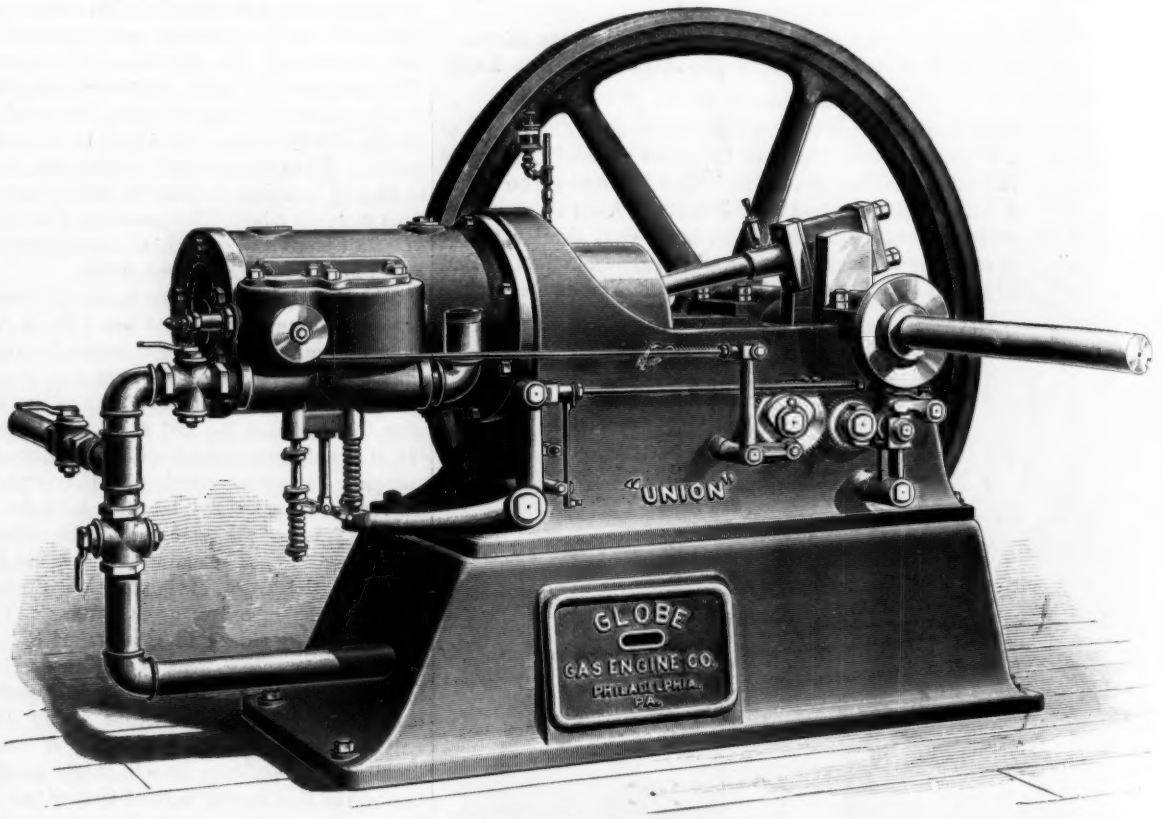


Fig. 32.—Union Gas Engine.

The Backus.—The first information I obtained in regard to this form is from the description in *Cassier's Magazine* for May, '93. I am later advised that the engine, made by the Backus Water Motor Co., of Newark, N. J., is of both horizontal and vertical form, Otto cycle type, and that it will be made in sizes from ½ to 100 H.P. It uses tube ignition, poppet valves, a cog gear for opening exhaust, and a centrifugal governor within the belt pulley that operates by opening or closing more or less the gas valve, omitting gas as required. A further device enables the changing of the speed of the engine while in motion. This engine is comparatively a new one on the market, having been introduced in 1890–92. Some 100 are now in use.

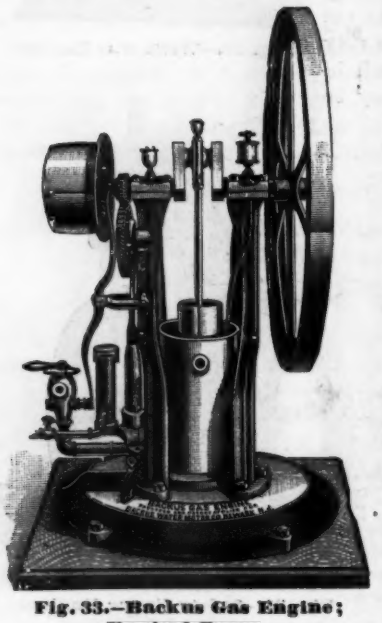


Fig. 33.—Backus Gas Engine; Vertical Form.

The Hicks.—No answer having been received to inquiries of the makers, I am again obliged to give *Cassiers Magazine* for July, '93, as my authority for what little knowledge I have of the engine. It is of novel design. Two cylinders are used, one above the other, each working on the Otto cycle and acting on the same piston rod. The valve action is arranged so that the cycles fire alternately, and thus an impulse is obtained every revolution. Gear wheels on the main shaft operate a cam shaft that through rods and tappets operate valves of the lift type.

An ordinary steam engine governor throttles the gas supply as needed. Method of ignition is not stated. The engine is made by the Hicks Gas Engine Works, of Cleveland, Ohio.

The Caldwell Charter.—This form of engine is essentially the Charter already described, but made by the H. W. Caldwell Son & Co., of 129 West Washington street, Chicago. The Mr. Charter of the Caldwell-Charter Co. is a son of Mr. John Charter, the designer of the original (Sterling) Charter engine. Hence the similarity of both form and detail that may be noted by a comparison of the cuts. The Caldwell-Charter has the same general make-up, the same cog driven poppet valves, tube ignition, governing by omission of charges, and Otto cycle as the Charter engine proper, and like it is largely used on gasoline.

In sizes, however, it is made somewhat larger, or up to 65 actual H.P. Redesigned by Mr. J. A. Charter in 1891, it was put on the market in '92, and over 100 engines, aggregating 800 or 900 H.P., are already in use. *Cassier's Magazine* for April, '93, gives a detailed description of this make of the Charter engine. There is no connection whatever between the Sterling makers and the Chicago concern.

The Lewis.—Still another of the small horizontal gas or gasoline type of motor is the Lewis, handled by the Webster Manufacturing Company, of 195 South Canal street, Chicago.

Excepting for detail, it is essentially the same (to judge from the cut) as the Charter, the Charter-Caldwell, the Weber, the Witte forms, etc., herein men-

Fig. 34.—Hicks Gas Engine.

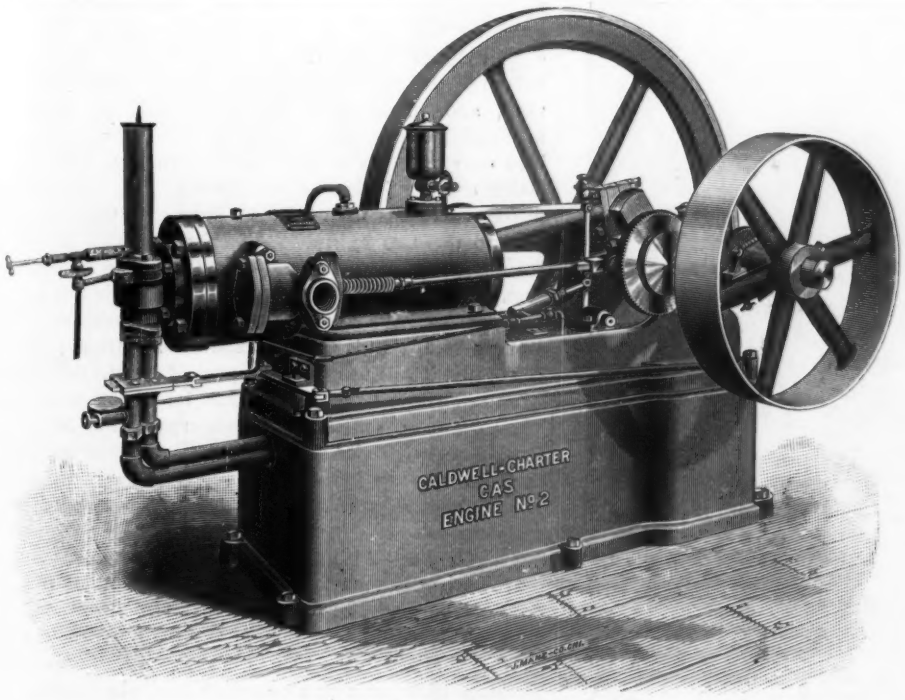


Fig. 35.—Caldwell-Charter Gas Engine.

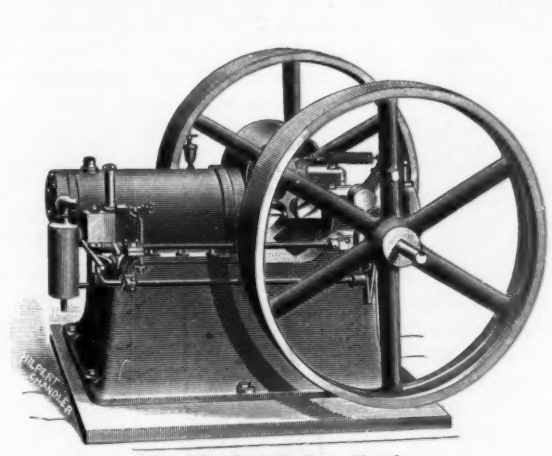


Fig. 13.—Lewis Gas Engine.

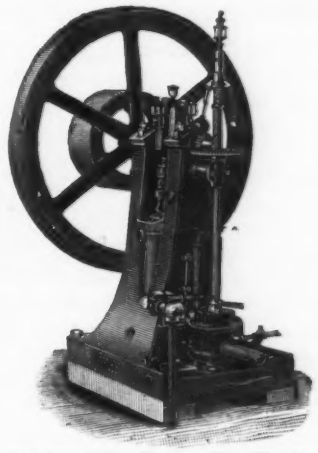


Fig. 37.—The Evans Gas Engine.

tioned. They all use the Otto cycle; they are all of horizontal trunk piston design; as a rule, all have poppet valves, are fitted with either tube or electric ignition, and use either gas or gasoline, as desired. The Lewis sizes run from 1 to 20 H.P. First designed by G. W. Lewis and put on the market in 1890, according to the makers something over 300 engines have already been sold in Chicago territory, representing some 1,500 H.P. This engine is also built in vertical form. Governing is by reducing the quantity of the charge. The makers claim that the engine is "second to none" on all the usual points of excellence, and quote but 20 to 23 cubic feet of gas per hour for each brake or actual H.P.

The Evans.—This form of engine, designed by Mr. Edwin W. Evans, has just (1893) come upon the market. In general it is similar to the many small vertical engines having the Otto cycle, etc., as usual with the cylinder at base. Its distinctive feature, however, is the use of but one simple rotary balance valve for performing all the functions of gas and air mixing, admission, exhaust and ignition, covered by letters patent for Dec. 13, 1892, No. 488,165. This is external and easily gotten at, and the concentration into one of what is usually covered by several moving parts, is certainly an attractive feature. The engine is as yet too new to have a record, but it promises to be a satisfactory one.

A bevel gear drives the valve. Tube ignition is used. The engine is handled by the Evans Gas Engine Company, of 23 South Front street, Philadelphia, and is made so far in sizes from 1½ to 5 ind. H.P.

The Connelly.—Among the newer forms of gas engines just now appearing upon the market is the "Connelly," illustrated herewith. This is the outgrowth of the street car motor that the Connelly Bros. (well known through the Connelly governor to the gas fraternity) have been perfecting for some years. It is said that this car motor has shown such satisfactory workings that the similar stationary engine for general work is now offered. The feature, as will be noted, is an auxiliary cylinder that "exhausts the spent charge and draws in a fresh one," thus enabling an impulse every revolution in the power cylinder, giving an advance in regularity of speed over any "Otto cycle" single cylinder engine. Of vertical type, with cylinder above, the floor space requisite for a given power is about the minimum so far reached. The governor principle is unique. "It controls the speed by a varying air pressure on a diaphragm connected with the gas valve, and is positive and peculiarly sensitive in its action." It also allows a variation of speed of from 40 to 200 revolutions if desired, according as it may be set. Valves are of poppet form operated by cams and there are no gear wheels. Ignition is by tube. Altogether it seems an attractive form and its performance will be watched with interest. Sizes of 5 and 10 H.P. are now ready and larger ones soon will be. It is handled by the Connelly Gas Engine Co., of 111 Broadway, New York, separately from the Connelly Motor Co., controlling the street car form and interests. This latter application of the Connelly motor will in all likelihood soon appear as an active factor in street car propulsion, owing to the success attending late exhaustive trials of the perfected form. There could be no better customer for gas than a street car line, continually running many cars, and from the standpoint of possible business in this direction, as well as an interesting application of gas motors, the Connelly car motor should be of especial interest to the gas man. A very large part of its satisfactory working is due to an exceedingly ingenious and simple mechanism for transmitting the power to the axle, whereby without altering the speed of the engine the power may be slowly applied for starting or increased for grades, etc., or the car reversed. This mechanism is described and illustrated in the American Gas Light Journal for Sept. 17th, 1888, and also in the Company's catalogue. The absolute superiority existing in a self-contained and cheaply operated motor for each car, rendering it independent of slots, grips, cables, conduits, trolley wires, batteries or break

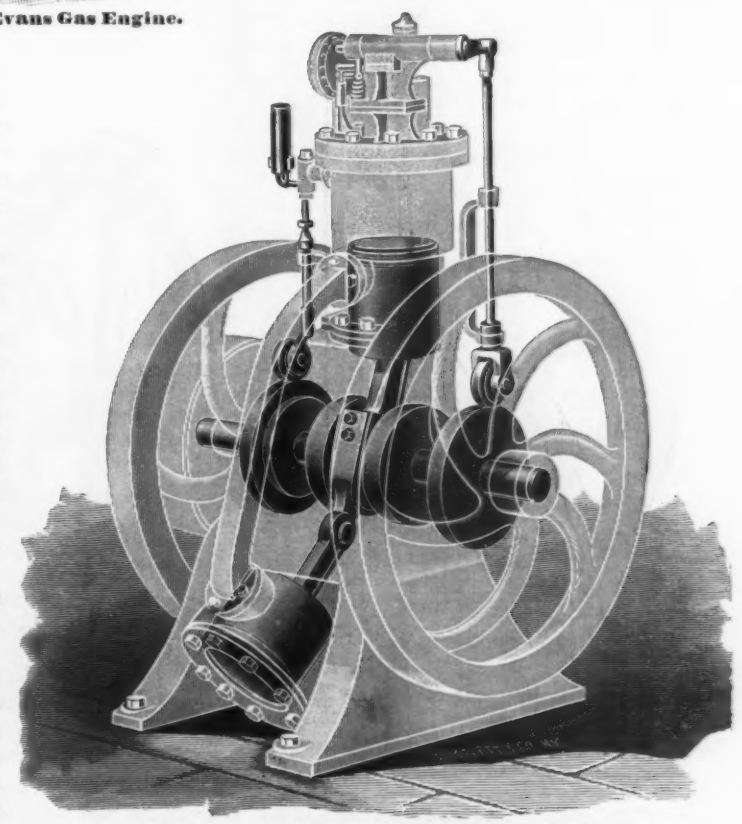


Fig. 38.—Connelly Gas Engine, Stationary Form.

Fig. 39.—Connelly Motor Car.

downs of a central plant, presents such attractiveness that to the writer it would seem that the gas motor is bound to grow into use.

The general appearance of a gas motor car is illustrated herewith.

The Pittsburgh.—This engine, designed by Messrs. Albert Schmidt and J. Chas. Beckfield, and now (1893) being put upon the market by the "Fuel Gas and Mfg. Co.," of Pittsburgh, Pa., at first glance at once suggests the well known form of Westinghouse steam engine, having the single acting twin cylinders, working downwards in an inclosed crank chamber, and the features of self-lubrication, provision for taking up wear, freedom from dust, etc., that are the distinguishing points of the Westinghouse engine. In cycle each cylinder is the Otto, the ignition is electric, the valves of the poppet form. The usual water jacket is used, and in addition the water and oil that for lubrication become thoroughly churned up and splashed into every portion of the crank chambers, serve as a water cooling jacket to the pistons. A "measuring piston valve" is used to feed a constant explosive mixture to the two cylinders alternately. This in turn is regulated by a governor that adjusts the amount of such mixture as may be required. The engine is as yet too new to have accepted records of operation. The makers state that it will be made in sizes from ½ to 200-H.P.; that it will be especially pushed for the driving of dynamos coupled direct, and that its strong points are "compactness, efficiency, speed, regulation and mechanical construction." The design calls for very few external moving parts or detail, and seems in many ways attractive, and its work will doubtless be watched with interest.

The Griffin.—Although this engine has not yet appeared upon the market, I feel that mention of it may properly be made, as I am told that two prominent gas men in this country are now engaged in testing sample engines that are in the United States, with the full expectation of organizing a company and placing the engine upon the market. In any event it is worthy of note, as apparently the one gas engine that has attained commercial success (some 2,000 or more having been sold) that is *double* acting—*i. e.*, has a closed cylinder with front head, and explodes each side of the piston, hence more nearly resembling the steam engine action, indicating one great step where more power than heretofore will, in the writer's opinion, ultimately be regularly had from a given size and general weight of engine. The great trouble so far has been that in double acting gas engines the intense heat of combustion (some 2,600° to 2,900° F.) has destroyed the lubrication and packing of the piston rod and stuffing box. Special water cooling glands are relied upon to cure this point in the Griffin form.

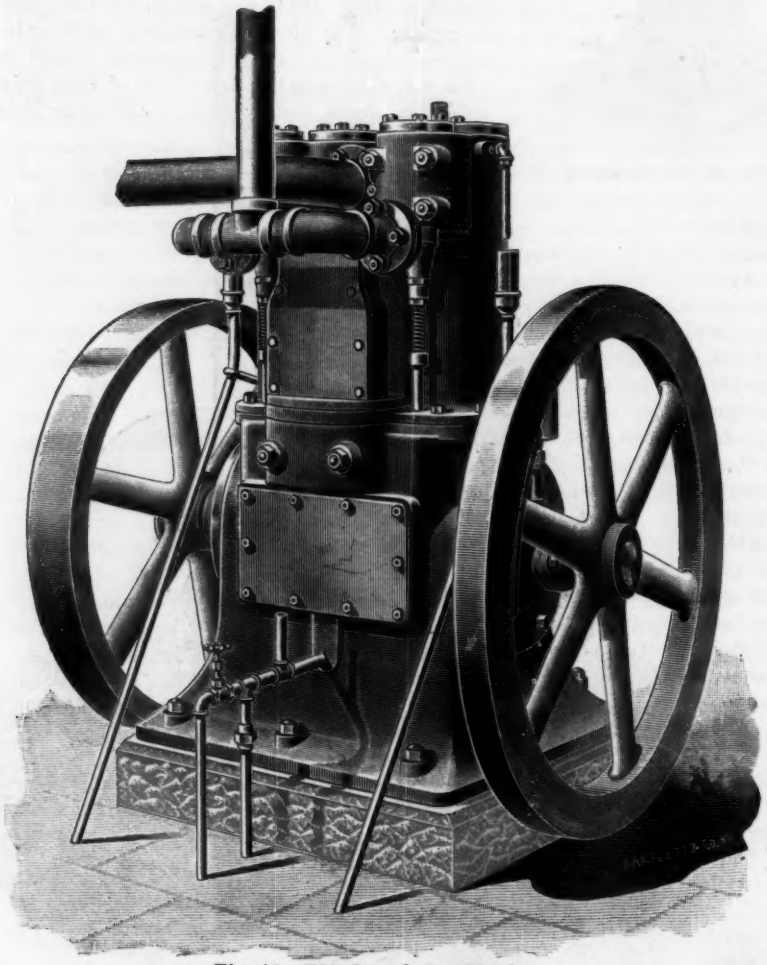


Fig. 40.—Pittsburgh Gas Engine.

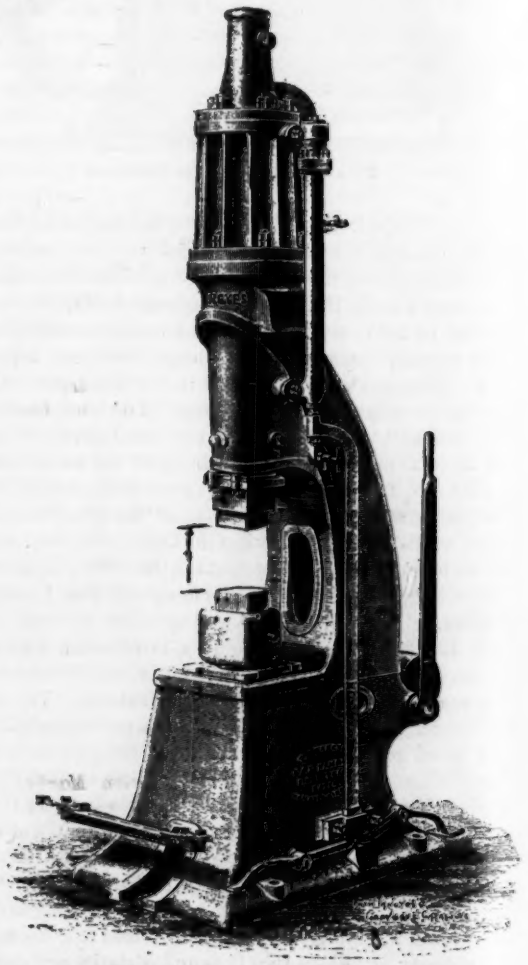


Fig. 41.—Tangye Gas Hammer.

The majority of the Griffin engines have been of the three-cycle class, the action at each end of the cylinder being as follows: The drawing in of the charge, compression, ignition and explosion, exhaust (so far like the Otto.) Instead of then repeating, a further revolution is first interposed, during which a charge of pure air is drawn in for scavengering and is ejected. Thus, three revolutions are passed before the cycle is repeated, but as the opposite end of the cylinder is performing the same cycle, an impulse is secured every 1½ revolutions and no auxiliary compression chamber is needed. The latest current form, however, has reverted to the Otto cycle. The engine has conical, spring valves of the lifting type, actuated by cams; a special cylinder lubricator and a small slide valve controlling a tube ignition. Governing is by cutting off the gas supply, thus missing explosions, for ordinary work, and by dilution for electrical plants. Figures of 17 feet per brake H.P. on the latest form of 50 H.P. size are given as the engines' efficiency. Very steady operation is a feature. It is said that in England this engine is largely used, and that the makers are prepared to build up to 500-H.P. in single cylinder engines. As a departure from existing lines, and a praiseworthy effort to secure double action in the gas engine, it is of great interest, as also from the fact that, as far as I can learn, the largest gas engines yet made have been upon this form, viz., 2 twin connected 300-H.P. engines giving 600-H.P.

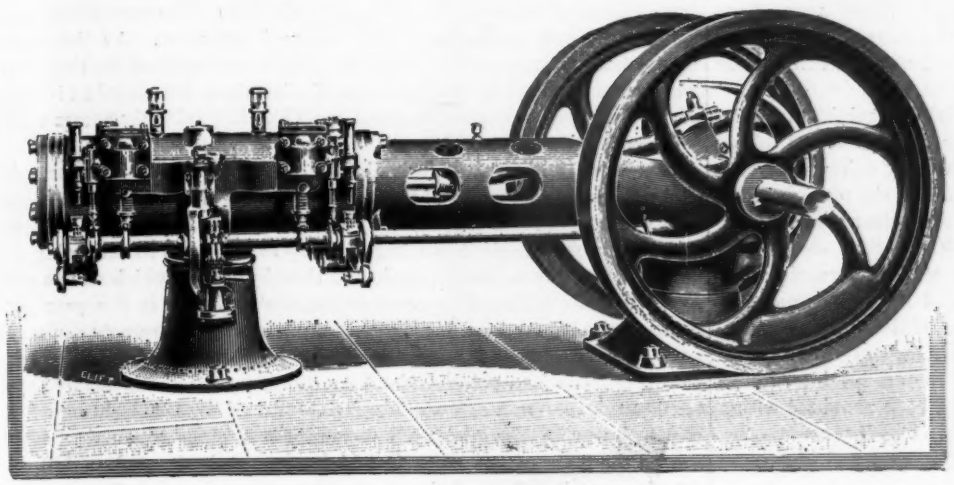


Fig. 42.—125-H.P. Double-Acting Griffin Gas Engine.

In classifying as to type, and summarizing, the above would appear as follows, arranged in classes, *alphabetically:*

TYPE I.—*Non Compression Engines.*

Class A.—Free piston: Otto & Langen.

Class B.—Fixed piston: Crown, Economic (first forms), Sombart.

TYPE II.—*Compression Engines.*

Class A.—Two or Otto cycle, compression in firing cylinder, and single acting: Atkinson (but with special action—see description), Backus, Charter (late form), Continental, Caldwell-Charter, Daimler, Economic (late form), Evans, Foos, Forward, Griffin (latest form), Hartig, Hicks, Korting (American form), Lawson, Lewis, Otto, Pacific, Parker, Pittsburgh, Regan, Safety Vapor, Sintz (early form), Union, Van Duzen, Weber, Witte, White & Middleton.

Class B.—One-cycle, compressing in auxiliary chamber and single acting: Baldwin, Charter (first form), Clerk, Connelly, Nash, Sintz (later form), Stockport (American form).

Class C.—Two-cycle with scavenger charge and single acting: Rollason (later horizontal form).

Class D.—Three-cycle, scavenger charge, double acting: Griffin (earlier form).

Arranged with respect to present commercial activity, *alphabetically*, and also grouped as "Eastern" or "Western" engines, so to speak, the engines listed would appear as follows:

Engines now Actively on the American Market.—East: Backus, Daimler, Evans, Hartig, Lawson, Nash, Otto, Pacific, Rollason, Safety Vapor, Union, White & Middleton. West: Charter, Caldwell-Charter, Foos, Hicks, Lewis, Sintz, Van Duzen, Weber, Witte.

Engines just Appearing on the Market (at Date of Writing of Paper, Aug., '93).—Connelly, Griffin, Pittsburgh.

Engines not now Actively Pushed.—Atkinson, Baldwin, Clerk, Continental, Crown, Economic, Forward, Korting, Otto & Langen, Parker, Regan, Sombart, Stockport.

New Incandescent Arc Lamps.

The incandescent arc, treated in Mr. L. B. Marks' paper, recently read before the Electrical Congress at Chicago, differs radically from any of the typical forms in which two electrodes are in imperfect contact. In it the electrodes are not in contact, while the current is indirectly used in maintaining all the products of disintegration of the carbon in a state of incandescence.

The arc is enclosed in a small envelope, which is made of highly refractory glass. The envelope is closed at the bottom and provided on top with a metal plug having an opening in it just large enough to admit of the feed of the upper electrode. A fireproof plug of asbestos pulp insulates the metal from the glass. A valve allows the egress of gas, but prevents ingress of the air.

Upon the closure of the circuit and the springing of the arc, the air in the enclosing envelope is robbed of its oxygen, the latter uniting with the carbon of the electrodes to form CO and CO_2 gases. The gases are brought to an exceedingly high temperature, at which they maintain the carbon vapor issuing from the arc. This vapor is deposited in the form of a thin coating on the internal surface of the glass chamber. The expansive force of the gases may become sufficiently great, if no means of egress be provided to rupture the envelope; hence, a small safety valve is provided for their outflow. The only possibility of ingress of air is through the narrow space between the positive carbon and the plug. Experience has shown that after the temperature has been raised beyond a certain point the amount of air that enters in this way is inappreciable. In any event the oxygen is immediately converted by combination.

It is important that the enclosing glass envelope be as small as possible for the conservation of the radiant energy, and hence the efficiency will depend largely upon the size of the chamber. The heat which, in the ordinary arc light, is dissipated in the air, is here conserved, and raises the temperature of the enclosed gases and vapor of the carbon. The proper conditions being fulfilled, the lamp maintains its maximum efficiency shortly after the current has been passed through it, and glows like the incandescent, with the brilliancy of the arc light. The arc proper is scarcely visible, but the entire contents of the chamber seem to be luminous, giving the appearance of a solid cylinder of light.

The pressure, as well as the temperature of the inclosed gases, has a very important bearing on the performance of the lamp, and affects to a marked degree the character of the carbon deposit on the glass chamber. At this date no definite figures can be given, but it appears that a high tension is absolutely required to give good results.

The structure and constituency of the electrode are also pre-eminently important. Absolute purity of the carbon is imperative. Investigations in this field have apparently found it impossible to obtain all the requisite conditions. Beardslee mentions a type of lamp similar to the one under discussion, but whether the size or character of the arc closing chamber, the nature or management of the gases, or the quality of the electrodes, or other features made his arrangement impracticable is not recorded. Suffice it to say, the comparatively poor grade of arc light carbon manufactured ten years ago would alone explain his failure.

It is interesting to note here that attempts have been made at various times to save carbons in arcs by excluding the oxygen of the air. Baxter devised several forms of arc lamp with this object in view. The subject has been more recently referred to by Thomson. These experiments were attended with little practical success, not because the desired ends were infeasible, but probably because, as in the case of Beardslee's apparatus, alluded to above, one or more of the requisite conditions had not been attained. It appears that the saving in life was more than counterbalanced by the loss in light. The "incandescent effect" was absent, and the unsteadiness of the arc itself was fatal. The results were almost identical with those obtained when the arc is formed *in vacuo*. In this case there is a tendency of the carbon to deposit as a soot on the sides of the vacuum chamber, an effect consequent upon the vaporized carbon in the arc being carried off and condensed again as soon as the vapor escapes the heat of the arc stream.

But the requisite conditions hereinbefore named being once attained, the arc is really a beautiful phenomenon. It differs in many respects

from the arc in open air, being especially steadier than the latter. The light emanating from the incandescent vapor of carbon appears to issue from all parts of the small inclosing envelope, the area of the source of illumination being limited only by the size of the chamber.

While it is true that the average efficiency of the electric arc in open air nets about 10 per cent., it is questionable whether in commercial practice in this country this value is often reached. The writer has made tests of a standard brand of arc light carbon where the efficiency was only 7¼ per cent.

Oxygen being practically excluded from the arc inclosing chamber, prolongation in the life of the electrodes is an implied concomitant. In the ordinary arc "while the positive carbon loses by volatilization from its tip, or crater, and by combustion from its sides, the negative gains no deposit, but wastes at a less rate than the other, and by combustion only."

Hence, if the exclusion of oxygen were complete we might expect an indestructible negative. This condition, however, has not been fulfilled in any of the tests made thus far, but the results fully substantiate the theory. Absence of combustion on the one hand and the tension of the inclosed gases on the other combine to greatly reduce the amount of dis integration of the positive electrode.

While it has been proved that the "humming of the alternating current arc is due to the rapid periodic extinction and re-establishment of the discharge," the singing tone may be greatly modified, if not entirely overcome, by the substitution of any incandescent arc of the Reynier type. A few years ago the writer had occasion to test an alternating current arc lamp trimmed with carbons which had been provided with a core of pulverized mica and carbon. The springing of the arc was accompanied by the usual hum, but as soon as the mica fused, the noise ceased. The conditions were similar to those of an incandescent arc, the plastic mica carbon core constituting a high resistance medium between the plus and minus electrodes. There was really no true arc. The amount of light was naturally greatly reduced. In the case of the incandescent arc first alluded to, there seems to be an approach to these conditions, the arc stream acted upon by the gases inclosed in the chamber appearing to have a greater density, if we may call it that, than under normal circumstances. The amount of light in this experiment was, however, apparently as great as in the direct current tests.

Explosion as Proximate Cause of Loss: Explosion as Fire Loss.

The Supreme Court of Illinois, through Judge Magruder, has handed down the following decision in the case of Heuer vs. Northwestern National Insurance, a case on appeal from the Appellate Court in the First Illinois District.

This policy is for insurance against loss or damage by *fire*, and contains the following provision: "This Company shall not be liable, by virtue of this policy, * * * for any loss or damage by fire caused by means of an earthquake; nor by an invasion, insurrection, riot, civil commotion, or military or usurped power; * * * nor for any loss caused by the explosion of gunpowder, nor by any explosive substance, nor by lightning or explosion of any kind, unless fire ensues, and then for the loss or damage by fire only." In the statement of facts it is agreed that, September 13, 1889, at 7 o'clock in the morning, an explosion took place in the basement of the building, by which the damage to the insured property occurred; that the explosion was produced by the lighting of a match in the basement, which was then filled with il luminating gas; "that the damage was a damage by the explosion produced in this manner, but was not a damage produced by the burning of the property insured;" that the illuminating gas was accidentally ignited by the flame from said lighted match, and burned, and instantaneously produced this explosion; that the ignition of the match and gas in the basement was immediately followed by a loud report and explosion; that the explosion, so caused, caused the falling of the floor of the store, and the damage to the goods; that there was no damage to the goods by the actual burning of them.

The question presented by the refusal of plaintiff's propositions is whether the loss sustained, under the circumstances thus detailed, was a loss by fire, within the meaning of the policy. It is conceded that no fire ensued from the explosion, and that the goods were not burned by fire, but were damaged by the falling of the floor, which was produced by the explosion. If, therefore, the loss was in any sense the result of fire, such fire could only have been the flame of the match, which came in contact with the illuminating gas. Is the loss to be attributed to the explosion, or to the lighting of the match, which preceded the explosion? If it is attributable to the explosion, the loss is not covered by the policy, and the Company cannot be held liable. The exemption clause provided that "this Company shall not be liable * * * for any loss caused by * * * explosion of any kind, unless fire ensues." The use of the expression "explosion of any kind," contemplates the existence of more than one kind of explosion. Without undertaking to made an accurate classification, we deem it sufficient to say that one kind of explosion is that which is produced by the "ignition and combustion of the agent of explosion," as where a lighted match is applied to a keg of gunpowder, and another kind of explosion is that which does not involve "ignition and combustion of the agent of explosion," as where steam or any other substance acts by expansion, without combustion. (Scripture vs. Ins. Co., 10 Cush. 356.) The exemption clause is broad enough to embrace both kinds of explosion. As the present case, where it appears that a lighted match was applied to the illuminating gas confined in the basement of a building, furnished an instance of the first kind of explosion above specified, it manifestly comes within the terms of the exemption.

It is a well settled principle in the law of insurance that the proximate, and not the remote cause of the loss must be regarded, in order to ascertain whether the loss is covered by the policy or not. * * * Where a lighted match is applied to a keg of gunpowder, or to illuminating gas confined in a room, and an explosion thereby occurs which causes damage, but is not followed by combustion, the explosion is the proximate cause of the injury, and the lighted match is only the remote cause. In such case, fire does not reach the property injured, but the concussion resulting from the explosion damages it. Here the goods insured were not brought in contact with the fire produced by the lighting of the match, but with the explosive power of a fireless concussion, which caused the floor of the store in which they were situated to fall, and thereby occasioned the injury. In Everett vs. London Assurance, 19 C. B. (N. S.) 126, a powder magazine, more than half a mile distant from the house insured, ignited and exploded, shattering the windows and window frames, and damaging the structure generally by the atmospheric concussion caused by the explosion, but not burning, heating or scorching any part of the premises; and it was there held that "it would be going into the causes of causes to say that this was an injury caused by fire to the property insured;" that the expression "loss or damage occasioned by fire" was to be construed as ordinary people would construe it; and that those words "mean loss or damage either by ignition of the article consumed, or by ignition of a part of the premises where the article is."

In Caballero vs. Ins. Co. 15 La. Ann. 217, where a fire broke out in a building about 200 feet distant, causing the explosion of gunpowder, which, by the concussion of the air, injured the building insured against fire, it was held that such a loss could not have been within the reasonable intendment of the parties, and was not covered by the policy. In Briggs vs. Ins. Co., 53 N. Y. 446, where the policy insured certain machinery in a mill against loss by fire, and contained a provision like the one in the case at bar, exempting the Company from liability "for loss caused by * * * explosions of any kind, unless fire ensues, and then for the loss or damage by fire only," vapors from the works in the mill where the business of rectifying spirits was carried on came in contact with a burning lamp in the mill, left there by persons repairing the machinery, causing an instantaneous explosion, which blew off the roof of the building, and blew down the greater part of the walls and injured the machinery, and also resulting in a fire which occasioned some damage, though slight compared with that caused by the explosion; and it was there held that the Company was liable for the damages caused by the fire which followed the explosion, but not for those caused by the explosion itself, the court saying, among other things: "The exception, too, is general, including explosions by fire, as well as others. There seems no reason for excluding an explosion like this from the exception. There was no fire prior to this explosion. The burning lamp was not a fire within the policy. The machinery was not on fire, as such term is ordinarily used, until after the explosion." So it may be said, in reference to the case at bar, that there was no fire prior to the explosion, and that the lighted match was not a fire, within the policy. In Ins. Co. vs. Foote, 22 Ohio St. 340, the policy insured a stock of merchandise against fire, and provided that the Company should not be liable for "any loss or damage occasioned by, or resulting from, any explosion whatever;" and it appeared that a mixture of whisky vapor and atmosphere, coming in contact with the flame of a gas jet in the still room, ignited from it and immediately exploded, setting a fire in motion which destroyed the insured property. It was held that the loss was from the fire occasioned by the explosion, and that the Company was not liable for it, under the broad language of the exemption clause, but it was at the same time held that the burning gas

jet "was not such fire as was contemplated by the parties as the peril insured against. The gas jet, though burning, was not a destructive force, against the immediate effects of which the policy was intended as a protection. Although it was a possible means of putting such destructive force in motion, it was no more the peril insured against than a friction match in the pocket of an incendiary." (See also Roe vs. Ins. Co., 17 Mo. 301; Montgomery vs. Ins. Co., 16 B. Mon. 427; St. John vs. Ins. Co., 11 N. Y. 516; Ins. Co. vs. Tweed, 7 Wall. 44; Wood, Ins. §104; Ins. Co. vs. Robinson, 64 Ill. 265; Ins. Co. vs. Dorsey, 56 Md. 70.) The determination of the question whether the loss is attributable to fire or to explosion, will sometimes depend upon the further question, whether the fire is an incident to the explosion, or whether the explosion is an incident to the fire. The effects of explosion will be included in the loss occasioned by a precedent fire producing the explosion, if the fire is the direct and efficient cause of the loss, and the explosion but the incident. A loss, other than by combustion, resulting from an explosion, when the explosion itself is caused by a destructive fire already in progress, comes within the general risk of a policy against fire only. It is not apprehended that it makes any difference, in the application of this principle, whether the fire operating as the principal cause of the loss, and to which an explosion occurring during its progress is a mere incident, originates in the building where the insured property is located, or out of it. (Ins. Co. vs. Dorsey, *supra;* Ins. Co. vs. Foote, *supra;* Briggs vs. Ins. Co., *supra,*) In Briggs vs. Ins. Co., *supra*, it was said by the New York Court of Appeals: "The explosion here was the principal, and the fire the incident. In such a case there can be no doubt that the defendant is not liable for the damage caused by the explosion. Where, however, the explosion is the incident, and the fire the principal, a different question would be presented. Had the building been on fire, and, in the course of the general conflagration, there had been an explosion of a boiler, which injured some machinery that the fire was rapidly consuming, different views and considerations might well obtain." In the case at bar, however, it cannot be said that the explosion causing the damage was an incident to a precedent fire, as the fire which preceded the explosion was nothing more than the flame of a lighted match.

There are some cases which appear to hold an opposite view upon this subject from the view here expressed. But those cases will be found upon examination to grow out of losses under policies which contain no clause exempting the companies from liability for loss by explosion. If the policy merely insures the property against fire generally, without making any exception of a loss by explosion, the flame of the lighted match or burning gas jet may be such a fire as is embraced within the terms of the policy; and the loss resulting from an explosion caused by the contact of a lighted match or burning gas jet with gunpowder or illuminating gas, or other explosive substance, may be covered by the policy. "The plaintiffs * * * insist that an explosion caused by fire is a fire, and therefore the defendant is liable for the explosion, as for a fire. But the reasoning gives no force to the exception. * * * It may be conceded that in the absence of this exception a recovery could have been had for the whole damage, as for a loss by fire. The authorities referred to by plaintiffs' counsel tend to that result. * * * An explosion without this exception, if it come under the general head of fire, might have afforded ground for recovery, but the defendant guarded against that result by this express stipulation." (Briggs vs. Ins. Co., *supra.*) In Scripture vs. Ins. Co., 10 Cush. 356, a burning match was applied to a cask of gunpowder in the attic of plaintiff's house. The gunpowder took fire, exploded, and blew off the roof of the house, and set fire to a bed and clothing, and charred and stained some of the woodwork. There the damage consisted in part of combustion and in part of explosion, and it was held that the whole damage was covered by a policy "against loss or damage by fire;" but there was no exemption in the policy there sued upon from loss by explosion. Nor was there any such exemption in the policies sued upon in the following cases referred to by counsel for appellant: Hobbs vs. Guardian, 12 Can. Sup. Ct. 631; Renshaw vs. Ins. Co., 103 Mo. 595, 15 S. W. Rep. 945; Waters vs. Ins. Co., II. Pet. 213; Renshaw vs. Ins. Co., 33 Mo. App. 394; Ins. Co. vs. Corlies, 21 Wend. 367. While these cases hold that an explosion caused by the application of fire to an explosive substance comes within the terms of a policy which insures against fire they do not hold that the loss thereby occasioned is a loss by fire only, and not a loss by explosion as well. As the policies there considered did not except losses by explosion, the question whether such losses resulted from fire or from explosion, or whether the one or the other was the proximate or remote cause of damage did not arise, and was not discussed. Where there is no exception of a loss by explosion the fire producing the explosion is a cause of the loss, so as to come within the meaning of the policy, even though it be the remote cause, and not the proximate cause. We think that the loss in this case resulted from the explosion, and not from any fire which preceded or followed the explosion, and that it comes within the terms of the exemption clause above quoted. We are therefore of the opinion that the lower court decided correctly in holding that the Company was not liable. The judgment of the Superior Court of Cook County, and of the Appellate Court, are accordingly affirmed.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

On the 18th inst. Mr. William R. Beal, President of the Central Gas Light Company, which supplies gas in a portion of the city north of the Harlem river, authorized the publication of the following notice: "On and after the 21st inst. the Central Gas Light Company will supply gas to consumers at the rate of $1.25 per 1,000 cubic feet. Hereafter no charge will be made for service pipes and connections. As no other Gas Company can offer better inducements, we are determined to retain the patronage of our present customers, and take this opportunity to assure all who desire to use illuminating gas of the best quality, of courteous treatment and prompt attention at all times."

Under the State law the Central Company, which does business in what is known as the annexed district of the city, can charge $1.60 per 1,000 cubic feet, and the Central Company had been charging that price up to the time named in President Beal's circular. No doubt the cut is the result of the appearance in the Central's district of the Standard Gas Light Company, which is now ready to supply gas in the annexed territory from its Pleasant avenue plant. The Company put its pipes under the Harlem river some time ago, thus enabling it to make a bid for patronage in the territory hitherto exclusively supplied by the Central.

In the 45th Annual Report of the Directors to the shareholders of the Consumers Gas Company, of Toronto, President Austin says: "The Directors are pleased to be able to lay before the stockholders a very satisfactory statement of the business and progress of the Company for the past year; 1,131 new services have been put in and 6 miles of mains have been laid, making the total mileage over 220. The additions to the works, referred to in the last annual report as being under construction or contracted for, were all satisfactorily completed within the specified time, and have all been paid for; and the manufacturing and storage capacities of the Company are now ample for several years to come. Having been satisfied, from the estimates of the General Manager, that they could afford to do so, and believing in the policy of selling gas at the lowest price consistent with the security of the stockholders, the Directors made the following reductions in price, which took effect 1st April last.

To consumers of 200,000 cu. ft. and under, per annum, from	$1.12½	to	$1.05	per 1,000
To consumers of over 200,000 and up to 500,000 cu. ft. per annum, from	1.05	to	1.00	"
To consumers of over 500,000 cu. ft. per annum, from	1.00	to	.90	"
For gas stoves, grates and engines, supplied by separate meters, from	1.00	to	.90	"

They are pleased to be able to report that these reductions have resulted in a largely increased consumption, especially for fuel purposes, the percentage of which upon the total consumption is becoming larger year by year. That so large a profit as that shown by the statement has been realized notwithstanding these reductions is matter for congratulation. The result is to be attributed partly to the increased consumption, but principally to the introduction of improved manufacturing plant, by which a large saving in labor and material has been effected. To reduce the Company's large indebtedness to their bankers, incurred to pay for the recent additions to the Company's works, the Directors decided to put on the market $100,000 of the new stock, as authorized by amendment to their act of incorporation. This stock was sold at public auction, on the 2d of October, and it cannot but be gratifying to the stockholders to learn that the average premium realized was 83.04 per cent., being the highest yet obtained for the stock sold in this manner. A comparative statement with that of the preceding year shows:

	Street Lamps.	Meters.	Gas Rental.
Year ending 30th September, 1893	1,189	17,702	$551,617.90
Year ending 30th September, 1892	1,201	16,164	512,554.17
	Decrease, 12	Increase, 1,538	Increase, $39,063.73

The Directors feel that they are only doing justice to the General Manager to state that the prosperous condition of the Company's business, and the efficient working of every department, are largely due to his ability, energy and careful supervision; at the same time, due credit should be accorded to the capable Superintendents, Chief Clerk and Accountant, and the office staff, who, in their various departments, have so ably supported him."

THE total income of the Company for the year was $627,492.51, divided as follows: Gas rents, $551,617.90; office rents, $2,575.75; tar, $26,139.13; coke, $39,336.44; ammoniacal liquor, $7,823.29. The total expenditures were $363,226.79, the three largest charges being $148,410.38 for coal, $47,527.13 for oil and $47,157.43 for wages at works, charged to manufacturing account. Dividends amounting to 10 per cent. on the capital stock ($1,600,000) were paid, and interest absorbed the sum of $5,895.15.

THE proprietors of the Connersville (Ind.) Blower Company are much elated over an award granted their blower exhibit at the World's Fair.

AT a meeting of the Ogdensburgh (N.Y.) Gas Light Company the following officers were chosen: Directors, W. L. Procter, Richard Chapman, I. L. Seymour, J. Y. Chapin and J. H. Findlay; President, W. L. Procter; Secretary and Treasurer, Richard Chapman.

AT a meeting of the Philadelphia Common Council, Mr. Cleaver introduced the following ordinance authorizing and directing the sale of the city gas works:

Section 1. The Select and Common Councils of Philadelphia do ordain that the Mayor of the said city be and he is hereby authorized and directed to sell at public sale, subject to the conditions hereinafter set forth, to the highest and best bidder, all the gas works of the said city, consisting of all and singular, the buildings, lands, tenements, goods, chattels, rights, credits assets and estate, real, personal and mixed, whatsoever and wheresoever, now vested in, belonging to, or possessed by said city, or the trustees of said works, or in anywise connected with the ownership, occupancy, management or control of the same, or any part thereof, and all the estate, right, title and interest of the said city and said trustees of, unto and out of the same, excepting and reserving however, the cash on hand, bonds, stocks, securities and amounts due the said trust for gas, coke, tar, lime, or other materials on the day of sale.

Sec. 2. Immediately upon the passage of this ordinance, the Mayor shall give 30 days' notice of the time, place, terms and conditions of sale by advertisement in all the public daily and Sunday newspapers published in said city, and in two newspapers published in each of the cities of New York, Boston and Chicago, and not less than 500 handbills, posted in the most public places in the city, and by circulars addressed to brokers and capitalists in each of the money centers; said publication to set forth the extent, value and advantages of said works.

Sec. 3. No bid will be received for less than $10,000,000, and no person shall be allowed to bid unless he or they shall first deposit with the City Treasurer the sum of $200,000 as an earnest that he or they will comply with the terms of the sale, said deposit to be made prior to the sale; and the said deposit shall become part of the amount to be paid if he or they shall be the successful bidders, or forfeited if they fail to comply with the terms of the purchase. The Mayor shall have the right to reject any bid which he deems not for the best interest of the city.

Sec. 4. No street or highway shall be opened for the purpose of laying mains without a permit from the proper authorized authorities.

Sec. 5. The sale of the said gas works shall not be complete until the same be confirmed by Council's passing an ordinance to that effect.

The ordinance was ordered to be printed and referred to the Committee on Finance.

MESSRS. JACKSON AND HERBERT, who were appointed a special committee by the City Council to investigate the matter of the high prices charged for the lighting by incandescent electric lamps of certain public buildings, have collected some interesting figures. Mr. Jackson said that one town reported that the lighting of its public hall was formerly carried out by means of a contract with the local electric lighting company at a charge of $19 per month for arc lamps, and $15 per month for incandescents. When this contract expired, the company agreed to light the structure on the basis of a meter rate, and the first bill rendered was one of $106 for the month. The Chairman also said that gas was being used in that town hall at the present time.

AT the annual meeting of the Gilroy (Cal.) Gas Company the following officers were chosen: Directors, L. A. Whitehurst, S. T. Moore, G. E. Hersey, H. R. Chesbro and A. Robinson; President, L. A. Whitehurst; Secretary, Geo. E. Hersey. A dividend of 8 per cent. on the capital stock was also declared.

THE Citizens Trade Association, of East Boston, Mass., asks that the Board of Gas and Electric Light Commissioners be petitioned to order a reduction in the gas rates charged by the East Boston Company.

THE municipal incandescent electric lighting plant, installed by the authorities of Peabody, Mass., is reported to be a very expensive property. At the rates charged the expenditures are well ahead of the receipts.

IT has been rumored that a Philadelphia syndicate was anxious to secure the property and franchises of the Lowell (Mass.) Gas Company. No doubt a Philadelphia syndicate, or for that matter a syndicate from any other city, would be held blameless for being possessed of such a desire; still, there is to be considered the desire of the Lowell proprietors to hold on to the good thing which they have so wisely managed for so many years. In fine, we have little doubt that there is any probability of a change in the ownership of the Lowell works.

THE Boston *Globe* of the 27th inst. says: "It can be stated with authority that the Roxbury Gas Light Company intends to reduce the price of gas in Roxbury to all its consumers on December 1st to $1 per 1,000 cubic feet. It will be remembered that the Brookline Company has agreed in its contract with the city of Boston to furnish gas in the same territory for $1, but its pipes are not fully laid, and it will be some weeks before it will be able to supply gas. In the meantime the Board of Gas and Electric Light Commissioners, upon the application of Mayor Matthews, had reduced the price of the Roxbury Gas Company from $1.50 to $1.20 per 1,000 cubic feet. Now comes this further reduction under the stimulus of the competition with the Brookline Company. The net result of the cheap gas agitation in the Roxbury district is thus a reduction from $1.50 to $1, or 33⅓ per cent. since Mayor Matthews first inaugurated the famous gas fight."

SOME time ago the people of Wilmington, Ohio, voted to put in an electric lighting plant, the same to supply current to ordinary consumers as well as to the public buildings, etc. They have tried the scheme practically for some time now, with the result that the Council claims, owing to the figures charged for the service, the city is losing money on every lamp in the circuit. We do not know the schedule price, but we do know that a committee "has been appointed to increase and revise the schedule."

THE regular quarterly dividend of the Consolidated Gas Company, of this city. has been declared. It is payable on December 15th.

THE Peoples Gas Light Company, of Brooklyn, N. Y., has declared a quarterly dividend of 1½ per cent., payable on and after December 15th.

AT the instance of the International Trust Company, of Boston, Mass., trustees of a mortgage created on September 1, 1890, and covering the property of the Middleboro (Mass.) Gas and Electric Company and the Middleboro Electric Light and Power Company (the latter concern was absorbed by the former), a sale of the effects of both Companies has been ordered, which sale is to be brought off on December 15th, at public auction, in the office of the Middleboro Gas and Electric Company. Of course, the sale is under regular foreclosure proceedings, and results from failure to pay interest. According to the advertisement announcing the sale, "The property to be sold includes a gas and Westinghouse electric light plant of the Middleboro Gas and Electric Company; also a Thomson-Houston electric light plant, formerly the property of the Middleboro Electric Light and Power Company, and the sale will cover all property, both real and personal, including machinery of every description, both electrical and steam, connected with the electric light and gas plants now or lately owned and operated by the Middleboro Gas and Electric Company; $2,000 to be paid at time of sale; balance on delivery of deed."

TOWARDS the close of November the Massachusetts Gas Inspector made a test of the gas supplied by the Spencer Gas Company, which showed the following satisfactory state of affairs: Candle power, 21.50

ammonia and sulphur content well within the limit prescribed by the statute.

In the case of M. J. Gavin against the Newton and Watertown (Mass.) Gas Light Company, who sued for $5,000 damages because of injuries sustained by him through inhaling gas which had leaked from a main of the Company into a sewer manhole in which plaintiff was working, the jury returned a verdict for the defendants. Mr. J. B. Goodrich managed the case for the Company.

A correspondent incloses the following: "The Davenport (Iowa) Gas Company has just completed an improvement of its service that will be greatly appreciated this winter. Heretofore the Bluff district has been supplied through a 4-inch main that went up Brady street, and the constant increase in the territory supplied by the Company has made it more and more difficult to give a satisfactory service on the Bluff. This was severely felt last winter, when the pipes were filled with frost so as to more or less completely shut off the supply from districts. As the days began to grow shorter this fall the need of heavier pressure again became apparent, especially in the early evening when the consumption was heavy in the business district. So, to remedy the deficiency in the Bluff service, another 4-inch main has been laid up Bridge avenue to 13th street, whence it runs west to Carey avenue, and north on Carey to 14th, where it connects with the east and west main heretofore supplied solely from Brady street. The main was put in use towards the close of November, and the relief afforded by it is marked. The Company is going along steadily, many cooking stoves having been put in during the past summer."

About a fortnight ago the Gas Light Committee of the San Francisco Board of Supervisors convened for the purpose of gaining further information with reference to the proposition to amend the gas rate. Mr. T. B. Bishop, attorney for the San Francisco Gas Light Company, denied that the Board had any jurisdiction in the premises, yet he said that he was willing to answer certain questions. He further stated the power rested with the Legislature. Supt. Hinton did not agree with Mr. Bishop in this respect and felt positive that the Board of Supervisors were endowed with the power to make gas rates, a position held also by the Corporation Counsel, who derived his belief from the Act of the California Constitution of 1878. Mr. Bishop replied that the Act was intended for the government of foreign corporations which transacted business in the State. He also insisted that the new Constitution positively stated that the Legislature alone had power to fix gas rates. In answer to questions by Supt. Hinton it was developed that the floating debt of the Company amounted to $921,000, and that the value of the property owned by it amounted to $7,000,000. The Company had $42,000 on deposit, held for the account of those who were furnished with meters. The capital stock was about $10,000,000. In reply to the assertion that the gas rate in San Francisco was higher than the average rate prevailing in other large cities of the country, President Crockett argued that when everything bearing on the question was considered, gas was cheaper in San Francisco than in most large cities. The Company's expenditures in 1892 were, roundly named, $1,000,000, divided up or apportioned as follows: Coal, $315,000; oil, $205,000; pay roll, $480,000. The receipts were $1,500,000 for gas, and $103,000 were realized from other sources. During last year the Company sold 801,000,130 cubic feet of gas, at an average price of $1.95 per 1,000, and a 5 per cent. reduction would occasion a decrease in receipts of $80,000. After paying the dividend last year the balance carried to credit of profit and loss was only $12,000. He contended the Company could not suffer a reduction of $80,000 in its receipts unless the wages paid for workmen were considerably reduced. At this point an adjournment was ordered.

The feeling prevalent in San Francisco regarding this investigation of the local gas rate is that the Board of Supervisors will order a reduction somewhere in the neighborhood of 10 per cent., which would mean the instituting of a net rate of $1.80 per 1,000. In this event the Company would undoubtedly appeal to the courts, with the prospect of the case ultimately reaching the Supreme Court of the United States.

The rates charged by the Redlands (Cal.) Electric Light and Power Company are as follows: Incandescent lights, 16-candle power each, per month, to midnight, 1 to 4 lights, 85 cents; 5 to 9 lights, 75 cents; 10 to 14 lights, 70 cents; 15 to 19 lights, 65 cents; 20 to 24 lights, 60 cents; 25 to 50 lights, 55 cents.

At the organization meeting of the City Gas Board, of Wheeling, W.Va., the following officers were chosen: Secretary, William H. Fee; Assistant Secretary, William Isham; Superintendent of Gas Works, S. M. Darrah; Collector, J. B. Wilkie. The first named replaces Mr. George Heil, whose services under the instruction of the Boards of 1892 and 1893 were complete and successful. Politics, however, caused the change.

The Economy Gas Company, of Muncie, Ind., has been incorporated with a capital of $25,000. The officers chosen are: President, J. W. Little; Vice-President, E. P. Smith; Secretary, Frank J. Claypool; Treasurer, Joseph G. Leffler; Superintendent, C. H. Anthony.

The *Journal*, of Lewiston, Me., says that on November 23d all the coal and coke belonging to the Belfast (Me.) Gas Company were attached by Boston parties for an alleged debt. As a result the consumers of gas were obliged for a time to use kerosene.

In mentioning the organization of the Gas Trustees of Wheeling, W. Va., we should also have reported that Mr. H. H. Dunlevy was re-elected President.

Governor Russell has designated Colonel John Wheelwright, who was appointed to fill the vacancy on the Board of Gas and Electric Light Commissioners occasioned by the resignation of the Hon. James W. McDonald, to be Chairman of the Board. It was thought by many that Mr. Forrest E. Barker would be promoted to the Chairmanship.

Patrick J. Tooley has brought suit against the Equitable Gas (natural) Company, of Pittsburgh, Pa., for $10,000 damages. He alleges that while he was shutting off the gas at a well the fittings, which were unsuitable and defective, blew off, causing an explosion which fractured one of his legs.

The New York Safety Car Heating and Lighting Company is considering the advisability of establishing a plant in Texas for the supply of gas to the sleeping coaches of the railroad systems passing through that State.

The Central Labor Union of Connecticut favors the platform of the People's Party, of New Haven, which has a paragraph to this effect: "We demand that the city shall obtain possession of the gas and water works, electric light plants, street railways, etc."

Incandescent Gas Lighting.

The London *Journal* notes that at a recent meeting of the Brussels Section of the Liege Association of Engineers, the present condition of incandescent gas lighting was dealt with by M. Sepulchre, the inventor of the mineral oil lamp which bears his name. He described the manufacture of Welsbach burners, especially the mantels; and he showed that it is possible with these burners to obtain flames of different colors. He produced the results of experiments, which proved that the cost of these appliances is soon compensated for by a diminution in the quantity of gas consumed, while at the same time the light afforded is remarkably intense Subsidiary advantages attending the use of these burners are that the temperature of the room is not so much increased, or the atmosphere so vitiated, as with ordinary burners.

On some members asking if the latter advantages were not counterbalanced by the fragility of the mantels and chimneys, M. Sepulchre replied that at first the manufacture of the chimneys was not quite satisfactory, but that now these reproaches could no longer be brought against the burners, which were coming more into use every day.

These particulars were confirmed by M. Aerts, the Gas Engineer to the Brussels Municipality, who observed that, in consequence of the success obtained with incandescent burners, a question was raised as to the advisability of generating gas for heating instead of for lighting. But he gave figures to show that the gas which is of the highest illuminating power also has the greatest calorific capacity; and it was this consideration, he said, which induced the manager of the works to enrich ordinary coal gas with gas produced from mineral oil; a double plant, for working alternately in 4-minute periods, being now erected for the purpose.

The new apparatus would produce water gas, which would be enriched by the aid of petroleum vapor; the mixture being superheated for fixing it. He added that this new method of manufacture might be carried on with any oils; but those called "intermediate" were to be preferred—Russian petroleum being the best. The plant at the Brussels gas works would permit of the daily production of 20,000 cubic meters (706,300 cubic feet) of 25-candle gas, with a yearly consumption of 3,000 tons of petroleum.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

EDITOR—Jos. R. Thomas, C.E.
ASST. EDITOR—T. J. Cunningham.
MANAGER—C. E. Sanderson.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 32 Pine Street, New York.

This is a recognized official organ of
LIGHT, HEAT, STEAM, WATER SUPPLY,
VENTILATION, SANITARY IMPROVEMENT,
AND GENERAL SCIENCE

TERMS:
SUBSCRIPTION—Three Dollars per annum, in advance. Single copies, 10 cents.

AGENTS
NEW YORK.—AMERICAN NEWS CO., 39 and 41 Chambers Street.
Germany.—B. WESTERMANN & CO., of New York.

MONDAY, DECEMBER 4, 1893.

The Market for Gas Securities.

Consolidated opened to-day (Friday) at 134 to 135, ex-dividend of 2 per cent., payable on and after December 15th. Judging from surface indications we are on the eve of a sharp upward movement in these shares, as the Company's business is increasing considerably. Mutual is steady and strong, and Equitable is again almost at the 200 mark. The rate war in the district north of the Harlem river is well under way, and the Central and Standard Companies are busily engaged in the strife for customers. It does not look like good business policy to cut rates in the face of the assembling of the Legislature, but that which seems un businesslike to one appears quite the reverse to another.

Brooklyn securities are hardening, in spite of the fact that consolidation looks to be as far off as ever. Meanwhile we again hint that old Brooklyn is cheap at anything under 110. It is quite on the cards that the Equity Company will soon appear in foreclosure proceedings. Consolidated, of Baltimore, continues to be unaccountably weak, at 53 to 53½, Chicago gas is booming, at 68⅞ to 69—to-day's opening price—and Bay State shows no change. We note a sale at auction of $3,000, Citizens, Brooklyn, first mortgage, at 98½; also, $3,000, Nassau, Brooklyn, scrip, at 100.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 WALL ST., NEW YORK CITY.

DECEMBER 4.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share. ☜

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	134	135x
Central	500,000	50	90	95
" Scrip	220,000	—	—	100
Equitable	4,000,000	100	190	195
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	108	112
Mutual	3,500,000	100	145	150
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	80	95
" Bonds	150,000	—	—	100
Richmond Co., S. I.	346,000	50	50	65
" Bonds	20,000	—	—	—
Standard Gas Co—				
Common Stock	5,000,000	100	—	32
Preferred	5,000,000	100	64	70
Yonkers		50	112	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	106	—
Citizens	1,200,000	20	55	—
" S. F. Bonds	320,000	1000	—	101
Equity Gas Light Co.	2,000,000	100	—	—
Bonds	1,000,000	—	25	40
Fulton Municipal	3,000,000	100	128	—
" Bonds	300,000		103	—
Peoples	1,000,000	10	78	—
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	98	100
Metropolitan	870,000	100	135	138
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	143	146
" Ctfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	135	—
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Bay State Gas Co.—				
Stock	5,000,000	50	16½	17
Income Bonds	2,000,000	1000	40	—
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	77	79
2d " " "	3,000,000	1000	—	57½
Buffalo Mutual, N. Y.	750,000	100	110	—
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
Chicago Gas Company.	25,000,000	100	68⅞	69
Chicago Gas Light. & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	81⅛	81½
Consumers Gas Light Co., Jersey City	2,000,000	100	—	30
Bonds	600,000	1000	—	85
Cincinnati G. & C. Co.	7,000,000	100	192	—
Consumers Toronto	1,600,000	50	184½	187
Central, S. F., Cal.			—	100
Capital, Sacramento, Cal			—	55
Consolidated, Balt.	11,000,000	100	53	53½
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	101
Bonds	250,000		—	—
Detroit Gas Co.—				
1st Mortgage			45	—
East River Gas Co., Long Island City	1,000,000	100	—	—
Bonds	500,000	100	86	87
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	101
Hartford, Conn.	750,000	25	120	128
Jersey City	750,000	20	190	200
Louisville, Ky.	2,570,000	50	125	130
Laclede Gas Light Co. St. Louis, Mo.—				
Common Stock	7,500,000	100	16½	17½
Preferred "	2,500,000	100	70	72
Bonds	9,034,400	1000	84½	85
Little Falls N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	200	208
Memphis (Tenn.) Gas	750,000	100	30	—
" Bonds	240,000	100	103	—
New Haven, Conn.		25	200	—
Oakland, Cal.			42⅝	43
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	108
2d "	2,500,000	1000	104	105
Peoples, Jersey City		—	160	170
" " Bonds			—	—
Paterson, N. J.		25	99	102
Rochester, N. Y.		50	80	85
Preferred			90	95
Bonds			90	95
Syracuse, N. Y.	500,000	25	—	—
San Francisco Gas Co. San Francisco, Cal.	10,000,000	100	65½	66
Washington, D. C.	2,000,000	20	240	—
Wilmington, Del.	500,000	50	180	182

Advertisers Index.

GAS ENGINEERS. Page

Jos. R. Thomas, New York City ... 817
Wm. Henry White, New York City ... 823
Fred. Bredel, New York City ... 819
H. C. Slaney, New York City ... 817
Geo. R. Rowland, New York City ... 817
Jas. R. Smedberg, Chicago, Ills ... 817

CHEMISTS.

E. G. Love, New York City ... 814

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md ... 821
United Gas Improvement Co., Phila, Pa ... 813
Burdett Loomis, Hartford, Conn ... 823
National Gas and Water Co., Chicago, Ills ... 815
Economical Gas Apparatus Construction Co., Toronto, Ont. 814
The Western Gas Construction Co., Fort Wayne, Ind ... 814

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd & Sons, New York City ... 823
Continental Iron Works, Brooklyn, N. Y ... 808
Delly & Fowler, Phila., Pa ... 823
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 820
Stacey Mfg. Co., Cincinnati, Ohio ... 823
Bartlett, Hayward & Co., Baltimore, Md ... 821
Davis & Farnum Mfg. Co., Waltham, Mass ... 810
R. D. Wood & Co., Phila., Pa ... 822
Bouton Foundry Co., Chicago, Ills ... 823
Isbell-Porter Company, New York City ... 822
Fred. Bredel, New York City ... 819
United Gas Improvement Co., Phila., Pa ... 813
Berlin Iron Bridge Company East Berlin, Conn ... 810
National Gas and Water Co., Chicago, Ills ... 815
Economical Gas Apparatus Construction Co., Toronto, Ont. 814
The Western Gas Construction Co, Fort Wayne, Ind ... 814

GAS AND WATER PIPES.

Mellert Foundry and Machine Co., Reading, Pa. (John Fox, Selling Agent, N. Y.) ... 825
Ohio Pipe Co., Columbus, Ohio ... 825
M. J. Drummond, New York City ... 855
R. D. Wood & Co., Phila., Pa ... 822
Warren Foundry & Machine Co., New York City ... 825
Donaldson Iron Co., Emaus, Pa ... 825
Addyston Pipe and Steel Co, Cincinnati, O ... 825

STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, New York City ... 819

GAS COALS.

Penn Gas Coal Co., Phila., Pa ... 817
Perkins & Co., New York City ... 816
Despard Coal Coal, Baltimore, Md ... 817
Westmoreland Coal Company, Phila., Pa ... 817
J. & W. Wood, New York City ... 816
Henry C. Scheel, New York City ... 817

CANNEL COALS.

Perkins & Co., New York City ... 816
J. & W. Wood, New York City ... 816
Henry C. Scheel, New York City ... 817

GAS ENRICHERS.

Standard Oil Co., Cleveland, Ohio ... 817

COKE CRUSHER.

C. M. Keller, Columbus, Ind ... 816

INCLINED RETORTS.

Parker-Russell Mining and Mfg. Co., St. Louis, Mo ... 818

RETORTS AND FIREBRICK.

J. H. Gautier & Co., Jersey City, N. J ... 818
B. Kreischer & Sons, New York City ... 818
Adam Weber, New York City ... 818
Laclede Fire Brick Mfg. Co, St. Louis, Mo ... 818
Borgner & O'Brien, Phila., Pa ... 818
James Gardner, Jr., Pittsburgh, Pa ... 818
Henry Maurer & Son, New York City ... 818
Baltimore Retort and Fire Brick Co., Baltimore, Md ... 818
Parker-Russell Mining and Mfg. Co., St. Louis, Mo ... 818
Brooklyn Fire Brick Works, Brooklyn, N. Y ... 818

GASHOLDER TANKS.

J. P. Whittier, Brooklyn, N. Y..... 819

GASHOLDER PAINT.

The Government Waterproof Paint Co., Boston, Mass..... 808

CEMENTS.

C. L. Gerould & Co., Brooklyn, N. Y..... 818

SCRUBBERS AND CONDENSERS.

G. Shepard Page's Sons, New York City..... 788
R. D. Wood & Co., Phila., Pa..... 822
James R. Floyd & Sons, New York City..... 824
Continental Iron Works, Brooklyn, N. Y..... 808

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md..... 821
Fred. Bredel, New York City..... 819
J. H. Gautier & Co., Jersey City, N. J..... 819
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 818

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City.. 815
Wilbraham Baker Blower Co., Phila., Pa..... 815

GAS GAUGES.

The Bristols' Mf'g. Co., Waterbury, Conn..... 814

TAR AND CARBONIC ACID EXTRACTOR.

Geo. Shepard Page's Sons, N. Y. City..... 824

AMMONIA CONCENTRATOR.

Michigan Ammonia Works, Detroit, Mich..... 807

GAS METERS.

John J. Griffin & Co., Phila., Pa..... 826
American Meter Co., New York and Philadelphia..... 827
The Goodwin Meter Co., Philadelphia, Pa..... 823
Heime & McIlhenny, Phila., Pa..... 827
D. McDonald & Co., Albany, N. Y..... 827
Nathaniel Tufts, Boston, Mass..... 826
Maryland Meter and Manufacturing Co., Baltimore, Md.... 826
Harris Bros. & Co., Philadelphia, Pa..... 826
Metric Metal Co., Erie, Pa..... 825

SELF-SEALING MOUTHPIECE DOORS.

Isbell-Porter Company, New York City..... 822
Continental Iron Works, Brooklyn, N. Y..... 808

BURNERS.

C. A. Gefroner, Phila., Pa..... 808
Moses G. Wilder, Phila., Pa..... 807

STREET LAMPS.

J. G. Miner, Morrisania, New York City..... 819
Bartlett Street Lamp Mfg. Co., New York City..... 819

PURIFYING MATERIAL.

Connelly Iron Sponge and Governor Co., New York City... 815
Greenpoint Chemical Works, Brooklyn, N. Y..... 815
Henry W. Douglas, Ann Arbor, Mich..... 815
Read, Holliday & Sons, Ltd., New York City..... 807

ELECTRICAL APPARATUS.

Wm. Henry White, N. Y. City..... 823
Fort Wayne Electric Co., Fort Wayne, Ind..... 735

EXHAUSTERS.

The P. H. & F. M. Roots Co., Connersville, Ind..... 812
Isbell-Porter Company, New York City..... 822
Wilbraham Baker Blower Co., Philadelphia, Pa..... 815
Connelly Iron Sponge and Governor Co., New York City.... 815
The Connersville Blower Co., Connersville, Ind..... 812

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y..... 810
Chapman Valve Manufacturing Co., Boston, Mass..... 810
R. D. Wood & Co., Phila., Pa..... 822
Continental Iron Works, Brooklyn, N. Y..... 808

GAS ENGINES.

Schleicher, Schumm & Co., Phila., Pa..... 792

ENGINES AND BOILERS.

The Hazelton Boiler Co., New York City..... 809

PURIFIER SCREENS.

John Cabot, New York City..... 814

GAS STOVES.

American Meter Co., New York and Philadelphia..... 811
The Goodwin Meter Co., Phila., Pa..... 823
George M. Clark & Co., Chicago, Ills..... 809
Maryland Meter and Manufacturing Co., Baltimore, Md.... 826
The Schneider & Trenkamp Co., Cleveland, O..... 808

DIVIDEND NOTICE.

OFFICE OF THE AMERICAN GAS COMPANY,
222 SOUTH THIRD ST., PHILA., PA., Nov. 15, 1893.

The Board of Directors of the American Gas Company have this day declared a semi-annual dividend of 3 per cent., or $3 per share, on the capital stock of the Company, payable on and after Dec. 23, 1893. MORRIS W. STROUD, Treasurer.

963-3

Seven per Cent. Gold Bonds for Sale.

To enlarge our works we offer for sale $10,000 in 7 per cent. 15-year bonds, interest payable semi-annually, and secured by a first mortgage on our entire works and property, valued at $45,000. Apply to

GAS AND ELECTRIC CO.,
963-4 Santa Ana, Calif.

Position Wanted

As Superintendent or Manager of a Gas Works

by young man of six years' experience. Technical education. Best of references. Address

965-2 "J.O. B.," care this Journal.

SITUATION WANTED

As Superintendent of a Gas Works

by a young man of 20 years' experience in all details of the business—manufacturing, mechanical and clerical. Has made the stove business a specialty for the last 8 years. Best of references.

965-4 Address "H. E.," care this Journal.

Position Wanted

BY AN ENGINEER AND SUPERINTENDENT,

who has had long experience in the construction and management of both gas and water works. Addess

965-2 "EXPERIENCE," care this Journal.

Position Wanted

As Manager of Small Gas Works, or Assistant Superintendent in a Large Gas Company.

Twelve years' experience and a thorough knowledge of the business, including bench building and meter repairing.

965-2 Address "A. E.," care this Journal.

Situation Wanted

As Superintendent of a Gas Works or Gas and Electric Combined,

by a young man posted in all branches. Has had considerable experience in construction of water and gas plants. Best of references given.

965-2 Address "H. L. D.," care this Journal.

Utilize Your Gas Liquor.
NO EXTRA LABOR OR OPERATING EXPENSES.

Ammonia Concentrator.

Not Expensive. Write to
STROH & OSIUS, Pat'ees, or
Mich. Ammonia Works, Detroit, Mich.

Valuable Gas Interest For Sale.

The undersigned will sell, to the extent of $20,000 to $50,000, in sums to suit purchaser, an interest in a growing gas business now netting 8 per cent.; increase this year will give net earnings of over 12 per cent. Money wanted for extensions to cover valuable territory. A magnificent opening for a party desiring a permanent occupation and investment in one of the most pleasant residence locations in California. Banks and business firms as references. Address for particulars and statement,

LOS ANGELES SAFE DEPOSIT AND TRUST CO.,
Stimson Block, corner Third and Spring Streets,
954-tf Los Angeles, California.

MOSES G. WILDER,

Mechanical Engineer,

816-822 Cherry St., Phila., Pa.

MANUFACTURER OF

Gas Governors,

Governor Gas Burners,

Gas Cocks and Fittings.

In addition to a full assortment of Volumetric Governors, etc., I am now making **MERCURY PRESSURE GOVERNORS** of all the usual sizes, adapted to use upon *Gas Stoves, Furnaces, and Meters.* The same careful attention to details of design and workmanship which has established the reputation of **WILDER'S VOLUMETRIC GOVERNORS** will be given to the new line. They have been thoroughly tested in many places during the past year, and have given entire satisfaction. The price is very low, and but for a complete system of machinery adapted to this work, it would be impossible to sell them at the price. I hope for large orders, as they become known, in consequence of the low price and good quality.

Read, Holliday & Sons, Ltd.

No. 7 Platt St., N. Y. City.

HYDRATED OXIDE OF IRON

For Gas Purification.

Analysis, Samples and Particulars on Application.

Pamphlet Free.

Felt & Tarrant Mfg. Co.
52 to 56 Illinois Street,
CHICAGO.
BRANCH OFFICE: 54 Franklin Street, New York.

Accountants who use The Comptometer

Save time, avoid mistakes and do not ruin their nerves. It is operated by keys, like a typewriter, and performs addition, multiplication, division, interest, etc., etc.

First Nat'l Bank, Brownsville, Texas, writes: "The Comptometer purchased of you has taken the place of one clerk in this office."

Brotherhood Wine Co., New York City, writes: "We would not be with out them if they cost twice as much."

McElveen Furniture Co., Ltd., Pittsburgh, Pa., writes: "In all the two years in which we have used it we have never known it to fail."

Brainard Co-Operative Building & Loan Association, Brainard, Minn., writes: "It is of more importance in a business office than a typewriter."

Supt. St. Lawrence State Hopital, Ogdensburg, New York, writes: "We could not get along without it except with the aid of an additional clerk."

To Gas Companies.

We make to order **CAP BURNERS** to burn any amount under a stated pressure. Send for samples.

Also, SERVICE CLEANERS, DRIP PUMPS, and STREET MAIN PROVING APPARATUS.

C. A. GEFRORER,

948 N. 8th St., Phila., Pa.

GASHOLDER PAINT.

Use Only

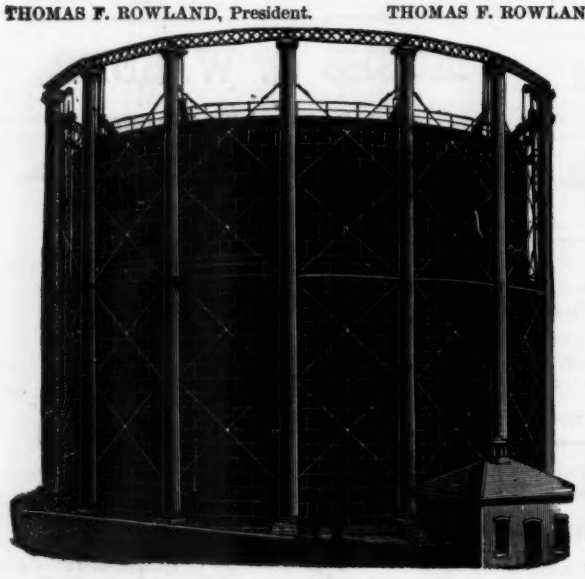
THE GOVERNMENT WATERPROOF PAINT.

Proof against Ammonia, and Absolutely Waterproof. Send for Prices and Particulars.

THE GOVERNMENT WATERPROOF PAINT CO., 104 High Street, Boston, Mass.

The Continental Iron Works

THOMAS F. ROWLAND, President. THOMAS F. ROWLAND, Jr., Secretary & Treasurer. WARREN E. HILL and CHAS. H. CORBETT, Vice-Presidents.



BROOKLYN, N. Y.

TAKE EAST TENTH OR TWENTY-THIRD STREET FERRIES FROM NEW YORK TO GREENPOINT.

BUILDERS OF

GAS HOLDERS.

Single and Multiple Section Gas Holders a Specialty.

Wrought Iron Gas Holder Tanks.

BENCH CASTINGS, RETORT LIDS.

Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, Etc., Etc.

SELF-SEALING RETORT MOUTHPIECES & LIDS.

For Round, Oval, or "D" Retorts.

Reliable Gas Heaters, Parlor Grates and Radiators.

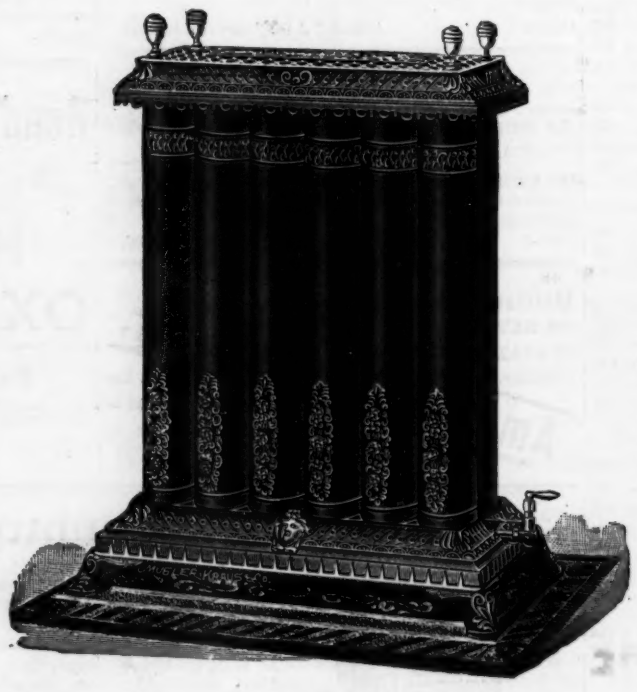
Three Distinct Lines.

Sixty Different Styles.

Ranging in Price from

$5.00 to $30.00.

Send for 1894 Catalogue of Heating Stoves.



New Designs and

Improvements for 1894.

The Largest and Most Complete Line ever Manufactured Under one Name.

The SCHNEIDER & TRENKAMP CO.,

Sole Manufacturers of Reliable Gas Heaters. **479-501 Case Ave., Cleveland, Ohio.**

Jewel Gas Heating Stoves
For 1893-94.

Send for Catalog of the Most Artistic Line of Heaters on the Market.

The New Double Reflector is Worthy of Attention.

22 Styles. Prices from $4.50 to $12.

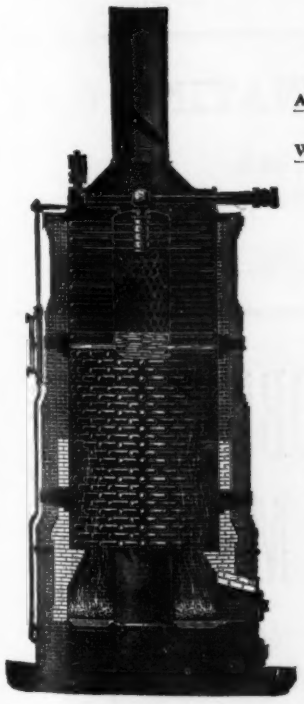
GEORGE M. CLARK & COMPANY,

MAKERS,

149-161 Superior St., Chicago

The HAZELTON BOILER Frequently Called The PORCUPINE BOILER

Patented in America and Abroad.



100,000 HORSE POWER

of this Justly Celebrated Water-Tube Boiler in Successful Operation in all the Principal Industries.

An Unparalelled Record, of Over Twelve Years, for Economy, Durability, Safety, and Efficiency.

A Common-Sense High-Pressure Boiler made in a Superior Manner.

We Solicit for it the Critical Examination of the Mechanical Profession and the Steam-Using Public.

THE HIGHEST STANDARD OF EXCELLENCE.

Standard Sizes, 50 H.P. to 500 H.P.

THREE REGISTERED
THE HAZELTON BOILER.

THE PORCUPINE BOILER.
TRADE MARKS.

Special Sectional Boilers For Export.

The only Genuine Hazelton or Porcupine Boilers bear our Three Registered Trade Marks.

∴ BEWARE OF IMITATIONS. ∴

This Company is prepared to Manufacture and Furnish Plants of Boilers of any desired capacity, and will forward proposals and other information on application. All imitations of the substantial features of this Boiler are infringements, and will be prosecuted to the full extent of the law.

THE HAZELTON BOILER CO.,

Sole Proprietors and Manufacturers, NEW YORK, U. S. A.

Cable Address, "PAILA," NEW YORK.

WRITE FOR ILLUSTRATED CATALOGUE.
Correspondence Solicited.

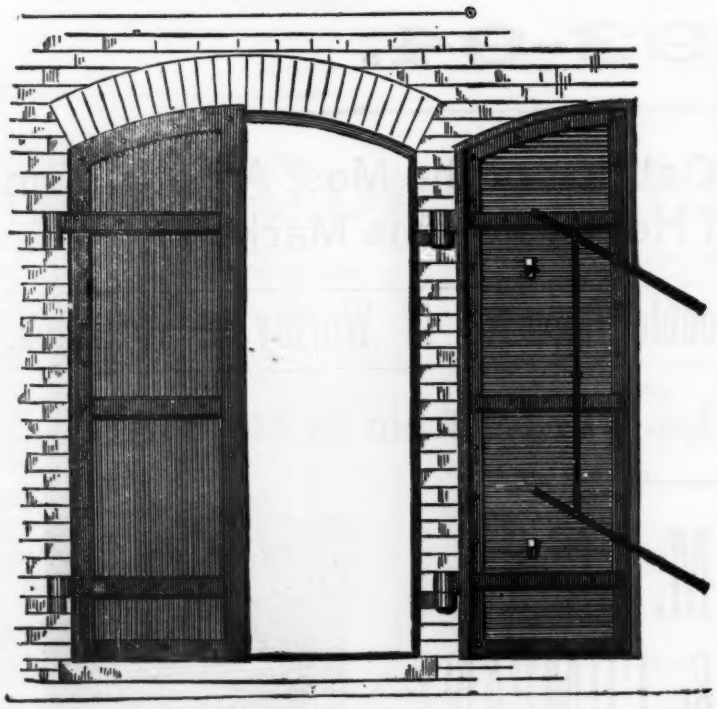
Long Distance Telephone, 1229-18th St., New York.

This Boiler is producing unequaled results in the works of most of the principal Gas Co.'s of the U.S., and in similar plants in Foreign Countries

NOT CONNECTED WITH ANY OTHER CONCERN IN THE UNITED STATES

CHAS. M. JARVIS, Prest. & Chief Engineer. BURR K. FIELD, Vice-President. FRANK L. WILCOX, Treasurer. GEO. H. SAGE, Secretary.

THE BERLIN IRON BRIDGE CO.



The accompanying illustration shows our regular pattern of Double-thickness Corrugated Iron Shutters, composed of two plates of corrugated iron (with the corrugations running at right angles to each other), built into a heavy angle-iron frame, thoroughly supported by bands, flanges, hinges and latch bars, forming a fireproof shutter which will not warp, twist or bend when exposed to the most severe heats.

WRITE FOR ILLUSTRATED CATALOGUE.

Office and Works:

No. 6 Railroad Avenue,

EAST BERLIN, CONN.

THE

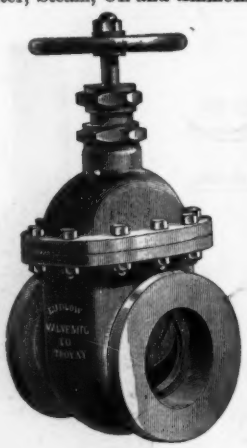
LUDLOW VALVE MFG. CO.,

MANUFACTURERS OF

VALVES,

Double and Single Gate, ½ in. to 72 in., outside and inside Screws. Indicator, etc., for Gas, Water, Steam, Oil and Ammonia.

SEND FOR CIRCULAR.



SEND FOR CIRCULAR.

ALSO,

Hydraulic Main Dip Regulators, Check Valves, Foot Valves, Yard Wash and Fire Hydrants.

OFFICE AND WORKS:

938 to 954 River St., & 67 to 83 Vail Av., TROY, N. Y.

Fuel and Its Applications

By E. J. MILLS, D.Sc. F.R.S., and F. J. ROWAN, C.E., assisted by others, including Mr. F. P. Dewey, of the Smithsonian Inst., Wash., D. C.

7 PLATES, AND 607 OTHER ILLUSTRATIONS. ROYAL OCTAVO, PAGES XX, 802. HANDSOME CLOTH, $7.50.

A. M. CALLENDER & CO., 32 Pine St., N. Y

CHAPMAN VALVE MANUFACTURING CO.,

MANUFACTURERS OF

Valves and Gates for Gas, Ammonia, Water, Etc.

Also, Gate Fire Hydrants with and without Independent Nozzle Valve. All Work Guaranteed.

Works & Gen'l Office, Indian Orchard, Mass. Treasurer's Office, 72 Kilby & 112 Milk Sts., Boston, Mass.
Chicago Office, 24 West Lake St. New York Office, 28 Platt St.

THE CHEMISTRY OF ILLUMINATING GAS.

By NORTON H. HUMPHRYS. Price, $2.40.

Orders may be sent to

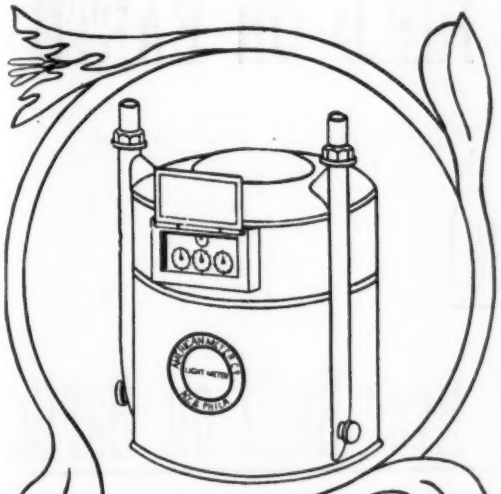
A. M. CALLENDER & CO., No. 32 Pine Street, New York City.

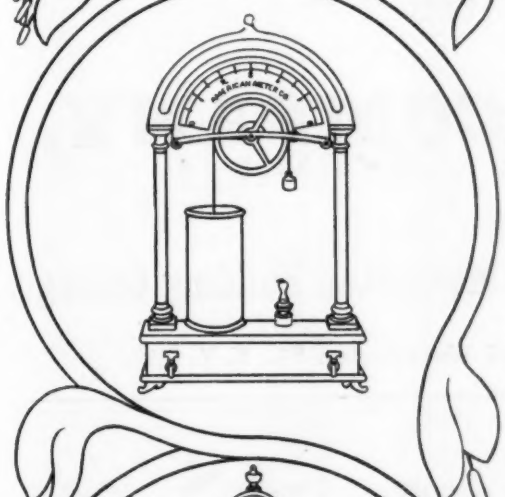
NEWBIGGING'S HANDBOOK FOR GAS ENGINEERS AND MANAGERS.

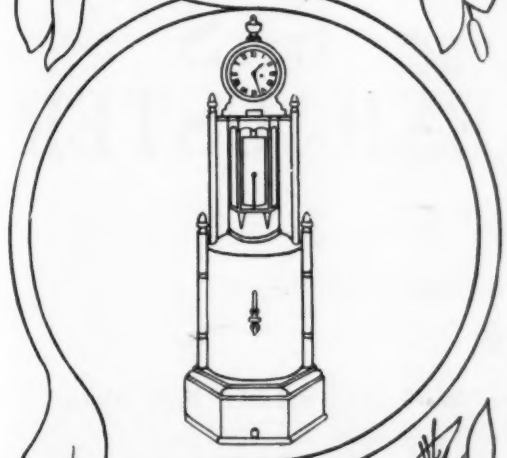
The present (the fifth) edition marks an important advance on those that have gone before. Considerable additions have been made to the text and much of it has been rewritten and otherwise improved.

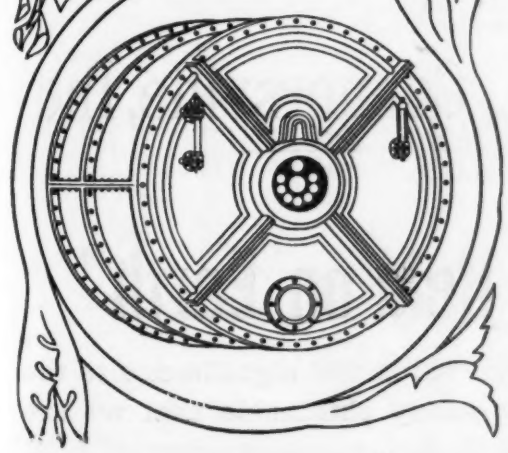
Price, Cloth, $6.

A. M. CALLENDER & CO., 32 Pine St., N. Y.









AMERICAN METER CO.

ESTABLISHED 1834. INCORPORATED 1863.

NEW YORK and PHILADELPHIA.

CHICAGO, CINCINNATI,

ST. LOUIS, SAN FRANCISCO.

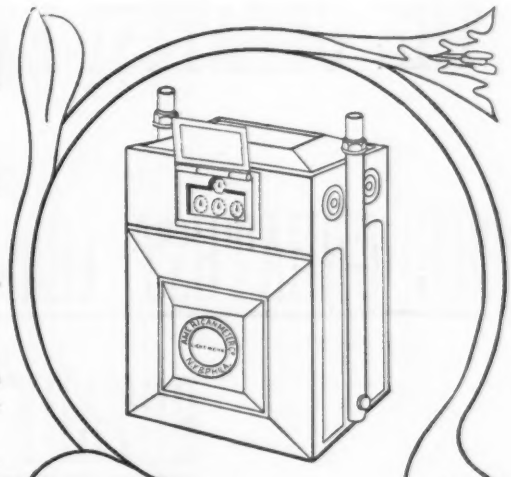
PUBLIC LIGHTING TABLE.

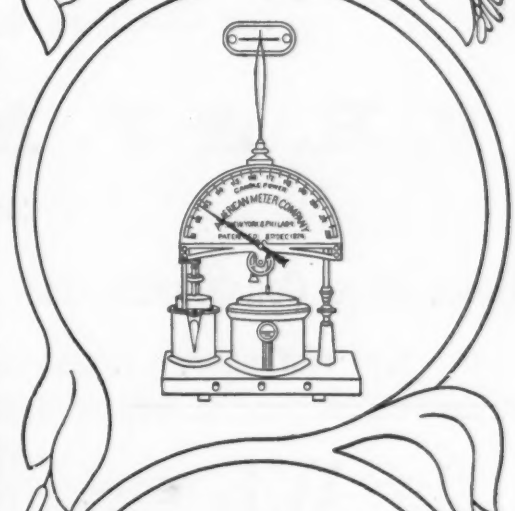
DECEMBER, 1893.

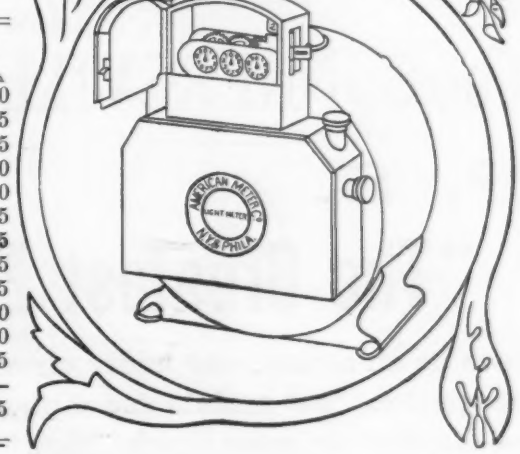
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P. M.	A. M.
Fri.	1	5.00 PM	2.30 AM	4.20	6.10
Sat.	2	5.00	3.30	4.20	6.10
Sun.	3	5.00	4.30	4.20	6.15
Mon.	4	5.00	5.40	4.20	6.15
Tue.	5	5.00	6.10	4.20	6.15
Wed.	6	5.00	6.10	4.20	6.15
Thu.	7	5.00	6.10	4.20	6.15
Fri.	8	5.00 NM	6.10	4.20	6.15
Sat.	9	5.00	6.10	4.20	6.15
Sun.	10	5.00	6.10	4.20	6.20
Mon.	11	5.00	6.10	4.20	6.20
Tue.	12	5.00	6.10	4.20	6.20
Wed.	13	8.30	6.10	4.20	6.20
Thu.	14	9.30	6.10	4.20	6.20
Fri.	15	10.30	6.20	4.20	6.20
Sat.	16	11.30 FQ	6.20	4.20	6.20
Sun.	17	12.50 AM	6.20	4.20	6.20
Mon.	18	2.00	6.20	4.20	6.20
Tue.	19	3.20	6.20	4.20	6.20
Wed.	20	4.20	6.20	4.20	6.20
Thu.	21	No L	No L.	4.20	6.20
Fri.	22	No L FM	No L.	4.20	6.20
Sat.	23	No L	No L.	4.20	6.20
Sun.	24	5.10	7.20 PM	4.20	6.25
Mon.	25	5.10	8.40	4.20	6.25
Tue.	26	5.10	10.00	4.20	6.25
Wed.	27	5.10	11.10	4.20	6.25
Thu.	28	5.10	12.20 AM	4.20	6.25
Fri.	29	5.10 LQ	1.20	4.20	6.25
Sat.	30	5.10	2.30	4.20	6.25
Sun.	31	5.10	3.30	4.20	6.25

TOTAL HOURS LIGHTING DURING 1893.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January...	217.30	January...	423.20
February..	200.30	February..	355.25
March	177.50	March	355.35
April.....	160.30	April.....	298.50
May.....	149.00	May.....	264.50
June.	140.30	June.....	234.25
July	143.40	July.....	243.45
August....	154.50	August....	280.25
September.	171.50	September.	321.15
October....	202.20	October....	374.30
November.	221.30	November.	401.40
December.	248.50	December.	433.45
Total..	2188.50	Total..	3987.45







THE GREATEST EXPOSITION EVER HELD ON EARTH

HAS AWARDED A MEDAL AND DIPLOMA TO

THE GREATEST (the "Roots," of course)

ROTARY GAS EXHAUSTER Ever Built on Earth.

The Judges say it is the "Best," too.

P. H. & F. M. ROOTS COMPANY,

MANUFACTURERS,

Home Office, Connersville, Ind. **Branch Office, 501 Manhattan Building Chicago.**

S. S. TOWNSEND, Gen. Agt., COOKE & CO., Selling Agts., 163-165 Washington St., N. Y. City.

WE GUARANTEE

THE BEST DESIGNED, . .
THE BEST CONSTRUCTED,
THE SMOOTHEST RUNNING,
THE MOST ECONOMICAL, .
THE MOST EFFICIENT . .

GAS EXHAUSTER

NOW ON THE MARKET.

The attention of Gas Engineers and Manufacturers is respectfully invited to our new

CYCLOIDAL EXHAUSTER,

the internal operating parts of which consist of two Revolvers, each p'aned accurately on cycloidal lines, the only Exhauster so constructed.

SIMPLICITY * EFFICIENCY * DURABILITY.

Correspondence Solicited.

The CONNERSVILLE BLOWER CO., Connersville, Ind.

P. S.

"The Greatest Exposition Ever Held on Earth"

Gave us an award, and under circumstances that attach unusual value and significance to the recognition; but medals and diplomas were so plentiful and so easily obtainable that we are not disposed to make much "blow" about it.

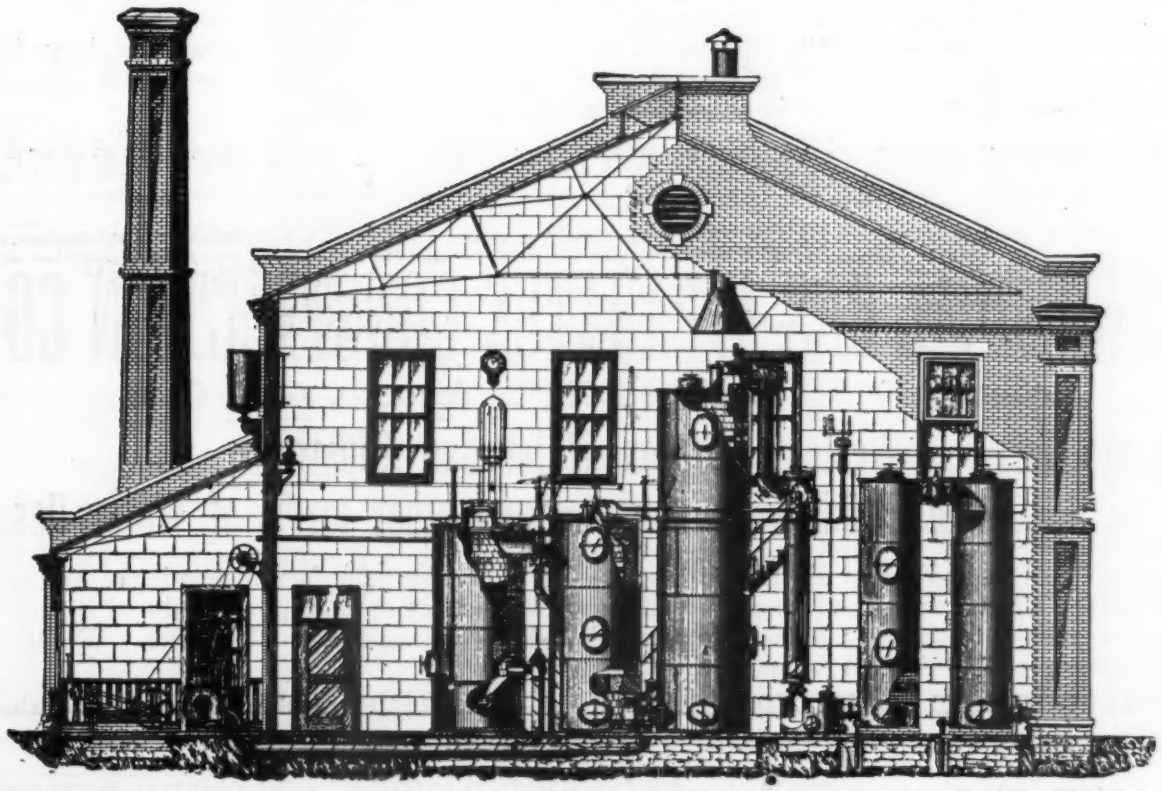
THE UNITED GAS IMPROVEMENT CO.,

DREXEL BUILDING, PHILA., PA.

Inquiries from any part of the United States should be addressed to the Philadelphia Office.

BUILDERS OF

THE STANDARD LOWE WATER GAS APPARATUS.



Standard "Double Superheater" Lowe Apparatus, designed for the use of Naphtha, Crude Oil, or "Distillates."

BUILDERS, LESSEES AND PURCHASERS OF GAS WORKS.

Water Gas Plants, either independent or auxiliary to Coal Gas Works, erected to meet any conditions. Apparatus designed to use any grade of Oil, and Anthracite Coal, or Gas House or Oven Coke.

PAMPHLETS, PLANS AND ESTIMATES FURNISHED UPON APPLICATION.

WATER GAS APPARATUS

BY THE

WESTERN GAS CONSTRUCTION CO.,

Of Fort Wayne, Ind.

The number of Water Gas Plants built by us this year fully testify to the merit of our **Improved** style of **Lowe Water Gas Apparatus.** Results obtained in the various sizes of our plants, up to over 900,000 cubic feet capacity per diem, show what can be attained in a well designed machine. We are prepared to **Guarantee Results,** as well as first-class construction. We build apparatus ranging in capacity from 50,000 cubic feet to 1,000,000 cubic feet per diem, and larger when required.

Our shop facilities are unexcelled, and enable us to quote prices which will prove interesting. The plants in operation demonstrate we have the **Experience** necessary to build Water Gas Apparatus on **Scientific** as well as **Practical** principles, and consequently **Build them Well.** Hence we don't hesitate to **Guarantee the Results.** We not only believe in "Water Gas on its merits," but also in building the apparatus at a price that will not only prove it a desirable investment as to the first cost, but produce results that will put the balance on the right side of your ledger.

There are three essential features in our design which we carefully considered as **Absolute Requirements:**

Durability, neatness, and compactness of the machine.

Minimum labor requirements for operation, and

Minimum amount of material required for results.

And when we add to this a minimum cost of a **Strictly First-Class Apparatus,** can you afford to be without it? If not, write us, and we shall take pleasure in proving our statements to be facts.

Also remember we are not exclusively building Water Gas Apparatus, but if you require **Any Apparatus** for **Coal or Water Gas** and want the latest and best designs, write us for prices, or we will execute carefully your own designs if desired, as we believe in giving you exactly what you want.

THE WESTERN GAS CONSTRUCTION CO., - FORT WAYNE, IND.

W. H. PEARSON, President. J. T. WESTCOTT, Gen'l Mang'r & Treas. (Formerly with The United Gas Improvement Co. L. L. MERRIFIELD, Chief Engineer. (Formerly with the United Gas Improvement Co.)

The ECONOMICAL GAS APPARATUS CONSTRUCTION CO., Ltd.

Office, 269 Front Street, East, Toronto, Ont., Can.

Owners of the Merrifield-Westcott-Pearson Water Gas Apparatus, and Builders of the Lowe and other forms of Water Gas Plants.

Our system includes a combination of the best processes of Water Gas manufacture now in use, and an apparatus of novel construction, which enables us to make a better and cheaper gas than can be produced by any other process. Guarantees given as to quantity of fuel and oil used, make per diem, and candle power. We also make an apparatus which is especially designed for small Gas Companies.

CORRESPONDENCE SOLICITED. **Plans and Estimates Furnished upon Application.**

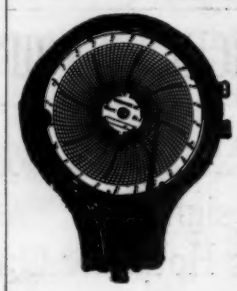
E. G. LOVE, Ph.D.,

Analytical and Consulting Chemist.

Analyses of Coals, Purifying Materials, Gas, Gas Liquor, Water, and all Technical Products. Photometric and Calorimetric Determinations.

122 Bowery, New York City.

BRISTOL'S RECORDING PRESSURE GAUGE



For Continuous Records of

Street Gas Pressure.

Simple in Construction,
Accurate in Operation,
Low in Price,
Fully Guaranteed.

Send for Circulars.

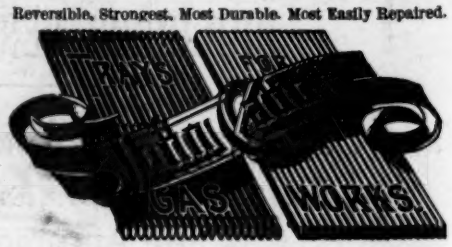
The BRISTOLS' MFG. CO.
Waterbury, Conn.

Received Medal at World's Columbian Exposition.

Special Trays for Iron Sponge or Oxide of Iron.

CHURCH'S TRAYS a Specialty.

Reversible, Strongest, Most Durable, Most Easily Repaired.



306-310 Eleventh Avenue, New York.

We also make the Cheapest and Strongest REVERSIBLE BOLTED TRAYS IN THE MARKET.

Send for Circulars

NATIONAL GAS AND WATER CO.,

218 La Salle St., Chicago, Ill.

HENRY C. REW, Prest. C. D. HAUK, Vice-Prest. & Mang'r. N. A. McCLARY, Sec'y. IRWIN REW, Treas. E. E. MORRELL, Engineer

Builders and Operators of Gas Works.

WATER GAS APPARATUS A SPECIALTY.

SOLE OWNERS OF THE REW SOFT COAL CARBURETED WATER GAS APPARATUS.

Guaranteed Estimates of Cost of Gas in Holder Furnished upon Application.

CONNELLY IRON SPONGE AND GOVERNOR CO.,

(Successors to CONNELLY & CO.)

MANUFACTURERS OF GAS WORKS SPECIALTIES.

"IRON SPONGE." Saves money, saves labor, and is the most efficient purifying material ever offered as a substitute for lime. We guarantee a large saving, both in cost of material and labor.

AUTOMATIC GOVERNOR.

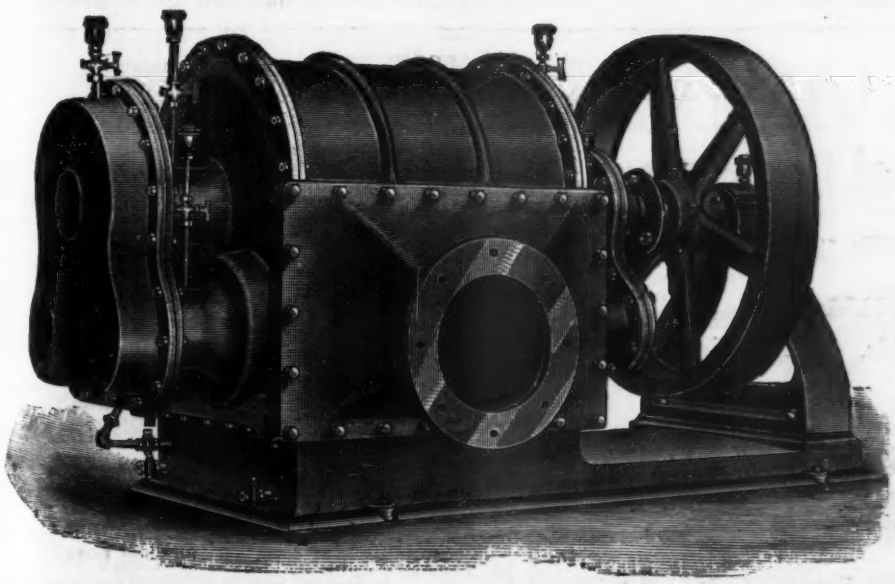
OVER FOUR HUNDRED NOW IN USE! NO WORKS COMPLETE WITHOUT IT!
WILL PAY FOR ITSELF WITHIN A YEAR! ITS SERVICE SECURES PERFECT DISTRIBUTION!
REDUCES LEAKAGE TO MINIMUM, and BENEFITS THE COMPANY and CONSUMER ALIKE!
IT IS THE ONLY RECOGNIZED AUTOMATIC GOVERNOR IN THE WORLD!

STEAM JET EXHAUSTER. Designed particularly for small works. Combines Exhaust Tube, Steam Governor, Gas Compensator and Bye-Pass Valves in the most compact form possible. Occupies but little space; uses very little steam; saves formation of carbon in retorts; increases yield 10 to 15 per cent. No works too small to use them profitably.

Prices given on all our specialties, delivered at any point in the United States. Correspondence solicited.

CONNELLY IRON SPONGE AND GOVERNOR CO., No. 365 Canal St., New York.

WILBRAHAM GAS EXHAUSTER



WILBRAHAM BAKER BLOWER CO., successors to WILBRAHAM BROS.,
PHILADELPHIA, PA.

IRON MASS

For Gas Purification.

Acts immediately, and more efficiently than any other purifying agent now in use.

Greenpoint Chemical Works.

JOHN SCHRIEVER, Manager.

Greenpoint Ave. & Newtown Creek, Brooklyn N.Y.

DOUGLAS' FERRIC OXIDE

For Gas Purification

Is a superior natural Hydrated Oxide of Iron. Will give a higher purification per bushel than any other material. We ship the pure Oxide of Iron, containing no sawdust, thus effecting a saving in freight, leaving the consumer to furnish the diluent at a nominal cost. It is now used by the largest gas companies in the West.

Full information, with references to many users, and prices delivered in any locality, furnished on application to

H.W. Douglas (Supt. Ann Arbor Gas Company) **Ann Arbor, Mich.**

GAS COALS. CANNEL COALS. COKE CRUSHERS.

JAMES D. PERKINS. **PERKINS & CO.,** F. SEAVERNS.

228 & 229 Produce Exchange, New York.

Cable Address, "PERKINS, NEW YORK." Post Office Box 3695, New York.

GENERAL SALES AGENTS FOR

The Youghiogheny River Coal Company's

OCEAN MINE YOUGHIOGHENY GAS COAL.

This Colliery is located at Scott Haven, Pa., in the center of the Youghiogheny Gas Coal District, and produces the only reliable Youghiogheny Coal for gas purposes. (See Map on p. 87 of this JOURNAL, Feb. 16, '85.)

Shipment from LOCUST POINT, BALTIMORE.

ALSO, SOLE SHIPPERS OF THE

Old Kentucky Shale, From Kentucky.

TRADE **O. K. SHALE.** MARK.

THE MOST VALUABLE GAS ENRICHER NOW AVAILABLE IN ANY DESIRED QUANTITY.

S. CALVERT FORD, Government Inspector at Washington, pronounces this Shale

"ONE OF THE BEST GAS ENRICHERS THAT HAS BEEN OFFERED TO THE TRADE."

He reports it as giving:

12,553 Cubic Feet of 50-Candle Gas,
or 10,460 Cubic Feet of 60-Candle Gas,

AN EQUIVALENT OF 627,650 CANDLE FEET,

And 808 Pounds of Merchantable Coke.

Single Carloads or more delivered at any required point in the United States or Canada.

Cargo Shipments from NEW YORK, PHILA., BALTIMORE and NEWPORT NEWS.

JAMES & WILLIAM WOOD,

Gas and Cannel Coal Contractors,

No. 40 St. Enoch Sq., Glasgow. No. 2 Talbot Court, London.

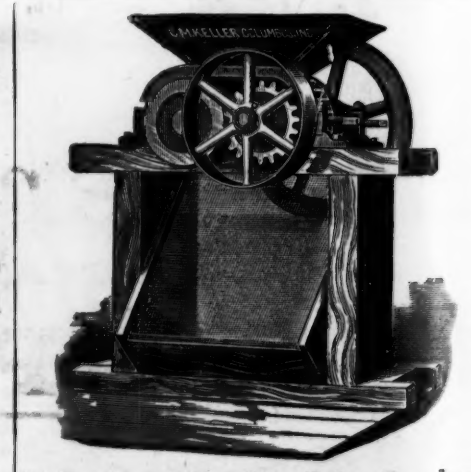
Proprietors of the **BATHVILLE COLLIERIES** (which produce the celebrated **BOGHEAD CANNEL**), Shields, Shieldmuir, Drumpeller, and other Collieries. This Firm offer

STANDARD CANNELS,

Unequaled as Gas Enrichers.

Analyses, prices, and all further information furnished on application to

Agency for United States 52 William Street, N. Y. City.



Keller's Adjustable Coke Crusher

SIMPLE, STRONG, AND DURABLE.

C. M. Keller, Sec. & Supt. Gas Lt. & Coke Co. Columbus, Ind.

Correspondence Solicited.

GAS ENRICHERS.

The Despard Gas Coal Co.,

MINERS AND SHIPPERS OF

DESPARD GAS COAL,

AND MANUFACTURERS OF

COKE.

MINES, Clarksburg, Harrison Co., W. Va.
WHARVES, Locust Point, Baltimore, Md.
OFFICE, 44 South Street, Baltimore, Md

ROUSSEL & HICKS, 71 Broadway, N. Y. } AGENTS. } BANGS & HORTON, 60 Congress St., Boston

Westmoreland Vein and West Va. Gas Coals.

BRECKENRIDGE AND LEXINGTON CANNELS.

HENRY C. SCHEEL, General Sales Agt.,

P. O. Box 2228. No. 1 Broadway, N. Y.

JOS. R. THOMAS,

No. 32 Pine Street, N.Y. City.

CONSULTING AND CONSTRUCTING

Gas Engineer and Contractor.

PLANS, SPECIFICATIONS, AND ESTIMATES FURNISHED.

Contracts taken for all Appliances required at a Gas Works,

Either for New Works or Extensions to Old Plants.

H. C. SLANEY,

Gas Engineer

466 Sixth Street, Brooklyn, N. Y.

Plans, Specifications and Estimates furnished for New Works, Alteration or Extension of Old Plants.

GEORGE R. ROWLAND,

Formerly with the Continental Iron Works.

Draughtsman and Constructing Engineer.

Drawings, Specifications and Estimates furnished for the construction of new works or alteration of old works. Special attention given to Patent Office drawings.

Office, No. 245 Broadway, N. Y. City.

JAMES R. SMEDBERG,

Gas Engineer and Architect,

Room 638, Rialto Building,
CHICAGO, ILL.

GAS COALS.

THE PENN GAS COAL CO.

OFFER THEIR

Coal, Carefully Screened & Prepared for Gas Purposes

Their Property is located in the Youghiogheny Coal Basin, near Irwin and Penn Stations on the Pennsylvania Railroad, and on the Youghiogheny River.

Principal Office:

209 SOUTH THIRD STREET, PHILA., PA.

Points of Shipment:

Pennsylvania Railroad Piers; Greenwich Wharves, Delaware River; Pier No. 1 (Lower Side), South Amboy, N. J.

EDMUND H. McCULLOUGH, Prest. CHAS. F. GODSHALL, Treas. H. C. ADAMS, Sec.

THE WESTMORELAND COAL CO.

Chartered 1854.

Mines situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Pa.

POINTS OF SHIPMENT:

PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J.,
WATKINS (SENACA LAKE), N. Y.

Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas-giving qualities, and in freedom from sulphur and other impurities.

Principal Office, 224 South 3d St., Phila., Pa.

The Management of Small Gas Works.

By C. J. R. HUMPHREYS

Price, $1.00.

A. M. CALLENDER & CO., 32 Pine St., N. Y.

Standard Oil Company,

GAS NAPTHA DEPARTMENT.

GAS NAPTHA.

GAS OIL.

Correspondence Solicited

26 Broadway, New York City.

RETORTS AND FIRE BRICK.

J. H. GAUTIER & COMPANY

CORNER OF

GREENE AND ESSEX STREETS,

JERSEY CITY, N. J.

MANUFACTURERS OF

Clay Gas Retorts,

Gas House Tiles,

Fire Bricks, Etc. Etc.

Ground Clay, Fire Brick and Fire Sand in Barrels,

J. H GAUTIER, Prest. CHAS. E. GAUTIER, Sec. & Treas.
CHA . E. GREGORY, V.-Prest. DAVID R. DALY Gen'l Mang'r.

Brooklyn Fire Brick Works,

MANUFACTURERS OF

CLAY RETORTS, FIRE BRICK,

Gas House and other Tile.

Office, 88 Van Dyke St., Brooklyn, N. Y.

RETORTS AND FIRE BRICK.

LACLEDE FIRE BRICK MFG. CO.,

MANUFACTURERS OF

Fire Brick, Gas Retorts,

AND

ST. LOUIS STANDARD SEWER PIPE.

Blast Furnace and Cupola Linings, every description of Fire Clay Material, Fire Clay Flue Linings, Chimney Tops Dry Milled and Crude Fire Clays, etc.

OFFICE AND DEPOT

901, 903, and 905 Pine Street,

ST. LOUIS, MO.

ESTABLISHED IN 1845.

B. KREISCHER & SONS,

OFFICE FOOT OF HOUSTON ST., E.R., N.Y.

Gas Retorts,

TILES, FIRE BRICK.

AND EVERYTHING IN THE FIRE CLAY LINE.

RETORTS AND FIRE BRICK.

MANHATTAN

FIRE BRICK & ENAMELLED CLAY

RETORT WORKS

ADAM WEBER.

CLAY GAS RETORTS

AND RETORT SETTINGS

FIRE BRICKS, TILES, ETC.,

Office and Works, 15th Street and Avenue C., N. Y

Works, LOCKPORT STATION, PA.

—ESTABLISHED 1864.—

JAMES GARDNER, JR.,

Successor to WILLIAM GARDNER & SON.

Conestoga Bldg., Wood & Water Sts. PITTSBURGH, PA, P. O. Box 37.

Fire Clay Goods for Gas Works.

SOLE REPRESENTATIVE OF THE McILHENNY REGENERATIVE BENCHES FOR THE U. S.

HENRY MAURER & SON,

(ESTABLISHED 1856.)

EXCELSIOR FIRE BRICK & CLAY

RETORT WORKS

WORKS, Perth Amboy, N. J.

OFFICE, 418 to 422 East 23d St., N. Y.

Clay Gas Retorts,

BENCH SETTINGS,

Fire Brick, Tiles, Etc.

GEROULD'S IMPROVED RETORT CEMENT.

A cement of great value for patching retorts, putting on mouth-pieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

PRICE LIST.

In Casks, 600 to 800 lbs., f.o.b. N. Y., at 5 cents per pound.
In Kegs, 100 to 200 lbs., " " at 6 " "
In Kegs less than 100 lbs., " " at 7 " "

C. L. GEROULD & CO.,

5 & 7 Skillman St., Brooklyn, N. Y.

Western Agent, H. T. GEROULD, Decatur, Ills.

Parker-Russell Mining and Mfg. Co.,

CITY OFFICE,

Mermod-Jaccard Bldg., Rooms 307 & 308, Broadway & Locust St., St. Louis. Mo.

PROPRIETORS OF THE

OAKHILL GAS RETORT & FIRE BRICK W'KS

Our immense establishment is now employed almost entirely in the manufacture of

Materials for Gas Companies

We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. We have the *exclusive Agency for the West* of the celebrated

Kloenne-Bredel Full Depth and Semi-Recuperator Benches,

And also furnish and build

Our Own Styles Semi-Recuperator Furnaces for the use of Coal or Coke as fuel.

THOS. SMITH, Prest. AUGUST LAMBLA, Vice-Prest. & Supt.

BALTIMORE

RETORT & FIRE BRICK CO.

MANUFACTORY AT

LOCUST POINT BALTIMORE MD.

Clay Retorts, Blocks & Tiles

FIRE BRICK, FIRE CLAY,

AND FIRE CEMENT.

Red and Buff Ornamental Tiles and Chimney Tops. Drain and Sewer Pipe (from 2 to 30 inches). Baker Oven Tiles 12x12x2 and 10x10x2.

WALDO BROS., 88 WATER ST., BOSTON, MASS

Sole Agents the New England States.

King's Treatise on Coal Gas.

In Three Volumes. Price per Vol., $10. Sold either by Volume or in Sets.

Standard text-book for the Engineers and Managers of Gas Works, and for all who are concerned or take an interest in the manufacture and distribution of Coal Gas, and in the utilization of the Secondary Products resulting therefrom; treating also of the Gas Engine and of Gas Cooking and Heating Appliances.

A. M. CALLENDER & CO., 32 Pine Street, N. Y. City

FRED. BREDEL, C. E.,

PROP'R OF KLOENNE AND BREDEL PATENTS.

Recuperative Furnaces, Purifying Machines,

* Gas Apparatus. *

Main Office, 118 Farwell Avenue, Milwaukee, Wis.

New York Office, 22 Beaver Street.

Gasholder Tanks & Gas Works Masonry Complete.

PLANS PREPARED AND ESTIMATES FURNISHED AT SHORT NOTICE.

J. P. WHITTIER, 70 Rush St., near Division Av., Brooklyn, N. Y.

A Large Quantity of Ground Fire Brick For Sale Cheap.

1893 DIRECTORY 1893

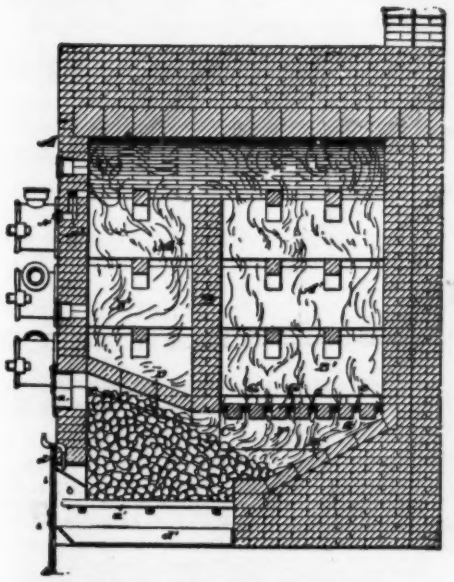
OF AMERICAN GAS COMPANIES.

Price, - - - - - - - - $5.00.

A. M. CALLENDER & CO., - - No. 32 Pine Street, New York.

FLEMMING'S

Generator-Gas Furnace



Materials furnished and Benches erected by

J. H. GAUTIER & CO., - Jersey City, N. J.

Address as above, or D. D FLEMMING, Jersey City, N. J.

AMERICAN GAS LIGHT JOURNAL.

$3.00 per Annum.

A. M. CALLENDER & CO.
32 Pine Street, N. Y

The Miner Street Lamps.

Jacob G. Miner,

No. 823 Eagle Ave., New York, N. Y.

Bartlett Street Lamp Mfg. Co.

MANUFACTURERS OF

Globe Lamps,

FOR

Streets, Parks, Public Buildings, Railroad Stations, etc.

LAMP POSTS

A Specialty.

Office and Salesroom,

40 & 42 COLLEGE PLACE, - - N. Y. CITY

Gas Companies and others intending to erect Lamp and Posts will do well to communicate with us.

Parson's Steam Blower,

FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREEZE OR OTHER WASTE MATERIAL.

PARSON'S TAR BURNER,

FOR UTILIZING COAL TAR AS FUEL.

PARSON'S AIR JET TUBE CLEANER,

FOR CLEANING BOILER TUBES.

These devices are all first-class. They will be sent to any responsible party *for trial.* No sa unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY.

H. E. PARSON. Supt., No. 54 Pine St., N. Y.

DAVIS & FARNUM MFG. CO.

WALTHAM, MASS.

PRINCIPAL OFFICE AND WORKS, WALTHAM, MASS. BOSTON OFFICE, Room 18, Vulcan Building, 8 Oliver Street.

Single, Double and Triple-Lift

GASHOLDERS

of any Capacity.

Tubular, Pipe and Sinuous Friction

CONDENSERS

of all Sizes.

STEEL TANKS for GASHOLDERS. IRON ROOF FRAMES and FLOORS.

Purifying Boxes, Center Seal or Valve Connections, Bench Work.

Reversible Lime Trays.

SELF-SEALING AND PRESSED STEEL MOUTHPIECE LIDS.

Coke Barrows, Coal Wagons, and all Apparatus Requisite for a Complete Gas Plant.

— ALSO —

GAS AND WATER PIPE, FLANGED PIPE,

Sugar House Work, and Special Castings of all Description.

This space belongs to the

KERR MURRAY MANUFACTURING COMPANY

All communications addressed to them at

Fort Wayne, Ind.

will receive prompt attention.

BARTLETT, HAYWARD & CO.

Baltimore. Md.

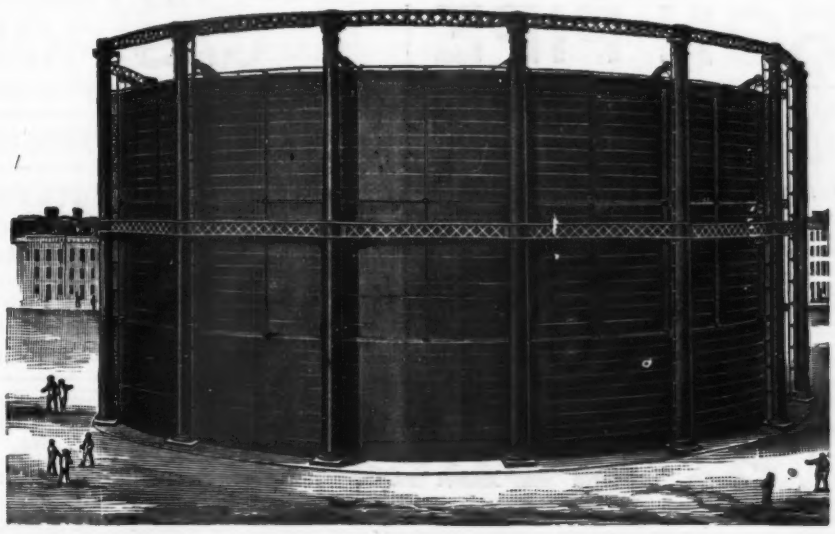
Triple Double, & Single-Lift
GASHOLDERS.

Iron Holder Tanks.

ROOF FRAMES.

Cirders.

BEAMS.



PURIFIERS.

CONDENSERS.

Scrubbers.

BENCH CASTINGS.

OIL STORAGE TANKS.

Boilers.

The Wilkinson Water Gas Process.

THIRTY-CANDLE, NON-CONDENSABLE, FIXED GAS. THE MOST SUCCESSFUL GAS PROCESS IN OPERATION.

Munich Regenerative Furnace, System Drs. Schilling & Bunte.

MILL'S REVERSIBLE LIME TRAYS.

Gas Works Designed and Constructed.

SCIENTIFIC BOOKS.

ING'S TREATISE ON THE MANUFACTURE OF COAL GAS. Three vols.; $10 per vol.

GAS MANUFACTURE, by WILLIAM RICHARDS. 4to., with numerous Engravings and Plates, in Cloth binding. $12.

TECHNICAL GAS ANALYSIS. $3.

GAS CONSUMER'S GUIDE. $1.

GAS CONSUMER'S HANDBOOK, by WILLIAM RICHARDS, C.E.; 18mo., Sewed. 20 cents.

A PRACTICAL TREATISE ON GAS AND VENTILATION with Special Relation to Illuminating, Heating, and Cooking by Gas, by E. E. PERKINS. $1.25.

CHEMISTRY OF ILLUMINATING GAS, by NORTON H. HUMPHRYS. $2.40.

PRACTICAL TREATISE ON HEAT, by THOMAS BOX. Second edition. $5.

STRAINS IN IRONWORK, by H. ADAMS. With plates. $1.75

GAS WORKS—THEIR ARRANGEMENT, CONSTRUCTION, PLANT, AND MACHINERY. $8.

COAL; ITS HISTORY AND USE, by PROF. THORPE. $3.50.

THE GAS WORKS OF LONDON, by COLBURN. 60 cents.

HEAT A MODE OF MOTION, by JOHN TYNDALL. $2.50.

MUNICIPAL LIGHTING, by F. H. WHIPPLE. $1.

THE MANAGEMENT OF SMALL GAS WORKS, by C. J. R. HUMPHRYS. $1.

MANUAL FOR GAS ENGINEERING STUDENTS, by D. LEE, 40 cents.

THEORY OF HEAT, by J. CLERK-MAXWELL. $1.25.

AMMONIA AND AMMONIUM COMPOUNDS, by DR. R. ARNOLD. $2.

THE DOMESTIC USES OF COAL GAS, AS APPLIED TO LIGHTING, by W. SUGG. $1.40.

DIGEST OF GAS LAW. $5.

DISTLLATION OF COAL TAR AND AMMONIACAL LIQUOR, by GEO. LUNGE. New Edition. $12.50.

A TREATISE ON THE COMPARATIVE COMMERCIAL VALUES OF GAS COALS AND CANNELS, by D. A. GRAHAM 8vo., Cloth. $3.

GAS COMPANIES DIRECTORY, 1892. $5.

THE AMERICAN GAS ENGINEER AND SUPERINTENDENT'S HANDBOOK, by WM. MOONEY. $3.

GAS ENGINE INDICATOR DIAGRAM, by W. E. AYRTON. Paper. 20 cents.

ILLUMINATING AND HEATING GAS, by W. BURNS. $1.50.

HANDBOOK FOR MECHANICAL ENGINEERS, by HENRY ADAMS. $2.50.

NEWBIGGING'S HANDBOOK FOR GAS ENGINEERS AND MANAGERS, by THOS. NEWBIGGING. Fifth edition. $6.

A TREATISE ON MASONRY CONSTRUCTION. BARKER. $5

FUEL AND ITS APPLICATIONS. $7.50.

ELECTRICITY.

THE ELEMENTS OF ELECTRIC LIGHTING, Including Electric Generation, Measurement, Storage, and Distribution, by PHILIP ATKINSON. $1.50.

ELEMENTARY ELECTRICITY, by PROF. F. JENKIN. 40 cts

ELECTRIC TRANSMISSION OF ENERGY, by G. KNAPP. $3

ARC AND GLOW LAMPS, by J. MAIER. Illustrated. $3.

ELECTRICIAN'S POCKET-BOOK, by MONROE and JAMIESON $2.50.

MAGNETISM AND ELECTRICITY, by J. OVEREND. 40 cents

ACCUMULATORS, by SIR D. SALOMONS. $1.20.

DYNAMO BUILDING, by F. W. WALKER. 80 cents.

ELECTRICAL TABLES AND FORMULÆ, by L. CLARK R. SABINE. $5.

ELECTRIC LIGHTING FROM CENTRAL STATIONS, by G FORBES. Paper. 40 cents.

ELECTRIC LIGHT PRECAUTIONS, by K. HEDGES. Illustrated. $1.

DOMESTIC ELECTRICITY FOR AMATEURS, by E. HOSPITALIER. $3.

The above will be forwarded by express, upon receipt of price. If sent by mail, postage must be added to above prices. We take especial pains in securing and forwarding any other Works that may be desired, upon receipt of order. All remittances should be made by check, draft, or post office money order.

A. M. CALLENDER & CO., 32 Pine Street, New York

Foundries and Works: { Millville, N. J. / Florence, " / Camden, "

R. D. WOOD & CO.

ENGINEERS, IRON FOUNDERS, MACHINISTS

400 Chestnut Street, PHILADELPHIA, PA.

MANUFACTURERS OF

CAST IRON PIPE

SOLE MAKERS OF

THE MITCHELL SCRUBBER

(PATENTED)

PURIFIERS, CONDENSERS, SCRUBBERS.

THE HOPPER AUTOMATIC GAS GOVERNOR.

BENCH WORK. PLATE GIRDERS.

IRON FLOORS AND ROOFS.

BUILDERS OF

GAS HOLDERS

Single, Double and Triple Lifts, with or without Wrought Iron or Steel Tanks.

PEASE'S PATENT WIRE ROPE GUIDING FOR GAS HOLDERS.

CUTLER'S
PATENT FREEZING PREVENTER
FOR GAS HOLDER CUPS.

THE TAYLOR REVOLVING BOTTOM GAS PRODUCER,
HEAVY LOAM CASTINGS, DUNHAM SPECIALS, HYDRAULIC WORK
LAMP POSTS, VALVES, ETC.

Coal Tar Genealogical Tree

MR. T. VINER CLARKE, of London, Eng.,

Having compiled a novel Chart or Map illustrating the various

CHEMICAL PRODUCTS DERIVED FROM COAL AND COAL TAR,

in the form of a Genealogical Tree, including all the products discovered to date (the total number amounting to near 700), offers for sale a limited number of copies in Colors, mounted on Linen, with Rollers. Price, $3.50. Orders may be sent to

A. M. CALLENDER & CO., - - No. 32 Pine Street, New York.

ISBELL-PORTER COMPANY,

G. G. PORTER, Prest. (Successors to SMITH & SAYRE MFG. COMPANY) CHAS. W. ISBELL, Secy.

ENGINEERS AND CONTRACTORS FOR THE

Construction and Extension of Gas Works.

Special Castings, Tees, Bends, etc.
Bench Castings.
Water Gas Generators.
Hydraulic Mains.
Iron Floors.
Brenner Self-Sealing Retort Lids.
Tar Gates and Hydraulic Main Dip Regulators.
Hutchison's Tar Displacement Apparatus.
Multitubular Condensers.
Standard Washer-Scrubbers.
Tower Scrubbers.
Walker's Tar and Carbonic Acid Extractors.
Exhausters.
Engines.
Steam Jet Exhausters.
Exhauster Governors.
Compensators.
Self-Acting Bye-Pass Valves
Valves.
Valve Stands with Indicators.
Purifying Boxes.
Purifier Valve System.
Center Seals.
Street Governors.

Estimates, Drawings and Specifications Furnished for the Alteration, Improvement, or Extension of Existing Works or the Construction of New Works.

ISBELL-PORTER COMPANY,

No. 245 Broadway, New York City.

GAS WORKS APPARATUS AND CONSTRUCTION. GAS WORKS APPARATUS AND CONSTRUCTION.

JAMES R. FLOYD & SONS,

(SUCCESSORS TO HERRING & FLOYD)

Oregon Iron Works,

W. 20th & 21st. Sts., bet. 10th & 11th Avs.,

NEW YORK CITY.

Engineers and Contractors

FOR THE

CONSTRUCTION OF GAS WORKS.

MANUFACTURERS OF

All Kinds of Castings and General Ironwork

FOR

GAS APPARATUS.

Bench Castings, Regenerative and Half Regenerative Furnace Castings.

Condensers, Scrubbers, Purifiers, Street Drips and Connections,

Valves,

Hydraulic Hoisting Purifier Carriage, Self-Sealing Retort Lids, Improved Valve Stand and Indicator, Seller's Cement.

Plans, Specifications, and Estimates furnished for Construction of New or Alteration of Old Works.

Bouton Foundry Co.,

FOUNDERS AND MACHINISTS,

CHICAGO, ILL.

Gas Works Apparatus,

PURIFIERS, CONDENSERS,

Bench Work

SPECIALS. LAMP POSTS,

SCRUBBERS,

Iron Roofs and Floors.

Plans and Estimates furnished for new works or extensions of old works.

H. RANSHAW, Pres. & Mangr. WM. STACEY, Vice-Pres. T. H. BIRCH, Asst. Mangr. R. J. TARVIN, Sec. & Treas.

STACEY MFG. CO.,

MANUFACTURERS OF

Single and Telescopic Gasholders,

IRON ROOFS, BRIDGES, LAMP POSTS,

Water and Oil Tanks, Coal Elevator Cars,

COKE CRUSHERS, BENCH CASTINGS,

And all kinds of Wrought and Cast Iron Work used in the erection of Coal and Oil Gas Works Rolling Mill Machinery and Heavy Castings a Specialty.

Foundry: 33, 35, 37 & 39 Mill Street.

Wrought Iron Works: 16, 18, 20, 22, 24 & 26 Ramsey Street.

Cincinnati, Ohio.

1842. # DEILY & FOWLER, 1893

Laurel Iron Works.

Address, No. 39 Laurel Street, Philadelphia, Pa.

BUILDERS OF

GASHOLDERS,

Single and Telescopic.

Holders Built 1886 to 1892, Inclusive

Galveston, Texas. (3d.)	Malden, Mass.	Lancaster, Pa. (3d	Oakland, Cal.	So. Bethlehem, Pa. (2d)
Fort Plain, N. Y.	Paducah, Ky.	Tacony, Pa. (two)	Central Gas Lt. Co., New York City (2d)	"Vassar College," N. Y
Brunswick, Ga.	Norwich, Conn.	Mount Vernon, N. Y		So. Chester, Pa.
Port Chester, N. Y.	Seattle, W. T.	Binghamton, N. Y.	Tacoma, Wash.	Cumberland, Md.
New Rochelle, N. Y.	San Diego, Cal.	Concord, N. H.	Knoxville, Tenn.	Auburn, N. Y.
Salem, N. J. (3d)	Westerly, R. I.	Dover, Del. (3d)	Pottstown, Pa.	DesMoines, Ia.
Omaha, Neb. (2d)	Northern Gas Lt. Co., of New York, N. Y.	Calais, Me.	Victoria, B. C.	Brooklyn, N. Y.
Lynn, Mass. (2d)		New London, Conn. (2d)	Vancouver, B C.	Washington, D. C. (2d)
Little Rock, Ark.	Willimantic, Conn	West Chester, N. Y.	Charlottesville, Va.	Wilkes-Barre, Pa.
Irvington, N. Y.	Montclair, N. J.	Bay Shore, L. I.	So. Framingham, Mass.	Bridgeport, Conn. (2d)
South Boston, Mass.	Attleboro, Mass.	Washington, D. C.	Woonsocket, R. I.	Sing Sing, N. Y.
Rye, N. Y. (2)	Santa Cruz, Cal.	Newport, R. I. (2d)	Simcoe, Can.	Exeter, N. H.
Staten Island, N. Y. (2d)	Erie, Pa. (3d)	Morristown, N. J.	Pittsfield, Mass. (2d)	Wilkes-Barre, Pa., ons
Woodstock, Ont.	West Chester, Pa. (2d	Lebanon, Pa.	Chattanooga, Tenn. (2d)	Lynn, Mass. (2d) [Gas Co

ILLUMINATING GAS! FUEL GAS!

The Loomis Process.

Now in successful operation at Works of John Russell Cutlery Co., Turner's Falls, Mass., and Henry Disston's Sons' Saw Works, Tacony, Pa.

The Cheapest Gas Generating System in the World.

Plans and Estimates Furnished.

BURDETT LOOMIS, - - Hartford, Conn.

WM. HENRY WHITE,

No. 32 Pine Street, - - - New York City.

ENGINEER AND CONTRACTOR FOR THE

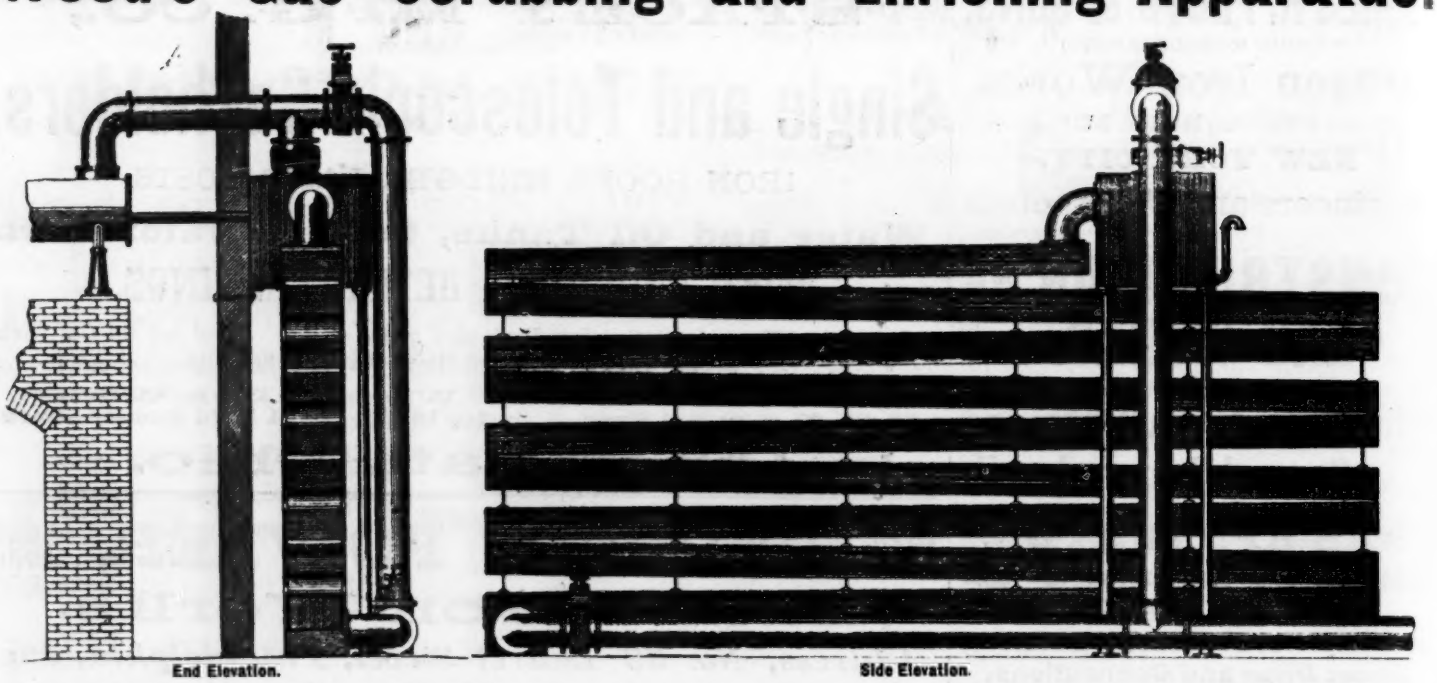
ERECTION AND EXTENSION OF

GAS, WATER, AND ELECTRIC LIGHT WORKS.

Correspondence with Gas Companies contemplating extending or improving their Plants respectfully invited

Plans and Estimates Furnished.

Wood's Gas Scrubbing and Enriching Apparatus.

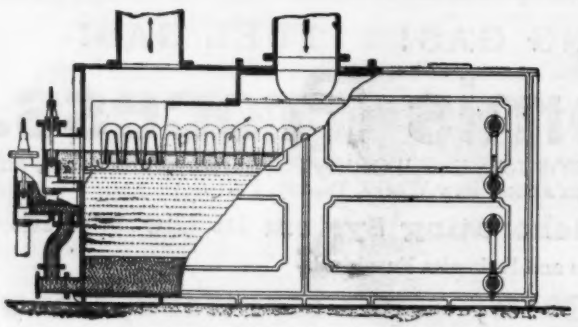


End Elevation. Side Elevation.

The cheapest, simplest, and most effective apparatus for removing Tar and Ammonia, and enriching Gas, ever brought to the attention of Gas Manufacturers. With ordinary condensers and scrubbers the condensable illuminants flow off to the tar wells and liquor tanks and are lost, but with Wood's Apparatus these illuminants are saved and retained in the gas, thus increasing its illuminating power and making a great saving in the cost of enriching material. Where set up next after the Hydraulic main, this Scrubber produces an 8-oz. Ammoniacal Liquor.

JAMES R. FLOYD & SONS, - - Nos. 531 to 543 West 20th Street, N. Y. City.

THE WALKER TAR AND CARBONIC ACID EXTRACTOR.



Built by ISBELL-PORTER CO., 245 Broadway, N. Y.

More than **300** in Use.

REMOVES ALL THE TAR AND A LARGE PART OF THE CARBONIC ACID.

Ask the Brooklyn Gas Company, the Bridgeport Gas Co., the Brookline Gas Co., the Nassau Gas Co., the Providence Gas Co., the Trenton Gas Co., and a number of others which we can't name for want of space, if IT won't.

GEORGE SHEPARD PAGE'S SONS,

Sole Agents. 69 Wall Street, New York.

FIELD'S ANALYSIS

For the Year 1892.

An Analysis of the Accounts of the Principal Gas Undertakings in England, Scotland, and Ireland. Being the Twenty-third Year of Publication. Compiled and Arranged by

JOHN W. FIELD, Accountant to the Gas Lt. and Coke Co., London.

Price, $5. For Sale by

A. M. CALLENDER & CO., - No. 32 Pine Street, N. Y. City

GAS AND WATER PIPES.

P. D. WANNER, Chairman. A. H. MELLERT, Mangr. of Wks.
R. B. KINSEY, Secretary. F. A. KNOPP, Treasurer.

MELLERT FOUNDRY & MACHINE CO. Ltd. and READING FOUNDRY CO., Ltd.

Reading, Pa.

Specials—Flange Pipe, Valves and Hydrants Lamp Posts, Retorts, etc.

General Foundry and Machine Work.

JOHN FOX, Selling Agent. **160 Broadway, N.Y.**

THE OHIO PIPE COMPANY,

MANUFACTURERS OF

Cast Iron Gas & Water Pipe,

BRANCH AND SPECIAL CASTINGS.

Gas-House Bench Castings, Hydraulics, Lamp Posts, Flange Pipe and Specials, Architectural Castings, Building Columns, Joists, Cellar Grates, Sash Weights, etc.

GENERAL FOUNDERS AND MACHINISTS.

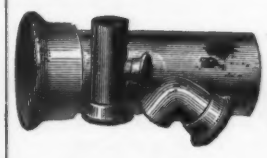
Columbus, Ohio.

GAS METERS.

WARREN FOUNDRY AND MACHINE CO.

Established 1856. Works at Phillipsburgh, N. J.

New York Office, 160 Broadway.



CAST IRON WATER AND GAS PIPE,

FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Branches, Bends, Retorts, etc., etc

M. J. DRUMMOND,

SPECIAL CASTINGS AND LAMP POSTS.

Office, Corbin Building, 192 Broadway, N. Y.

EMAUS PIPE FOUNDRY.

DONALDSON IRON COMPANY. EMAUS, PA

MANUFACTURERS OF

CAST IRON PIPE AND SPECIAL CASTINGS

FOR WATER AND GAS.

THE ADDYSTON PIPE AND STEEL COMPANY,

CAST IRON.

PIPE.

CINCINNATI, OHIO.

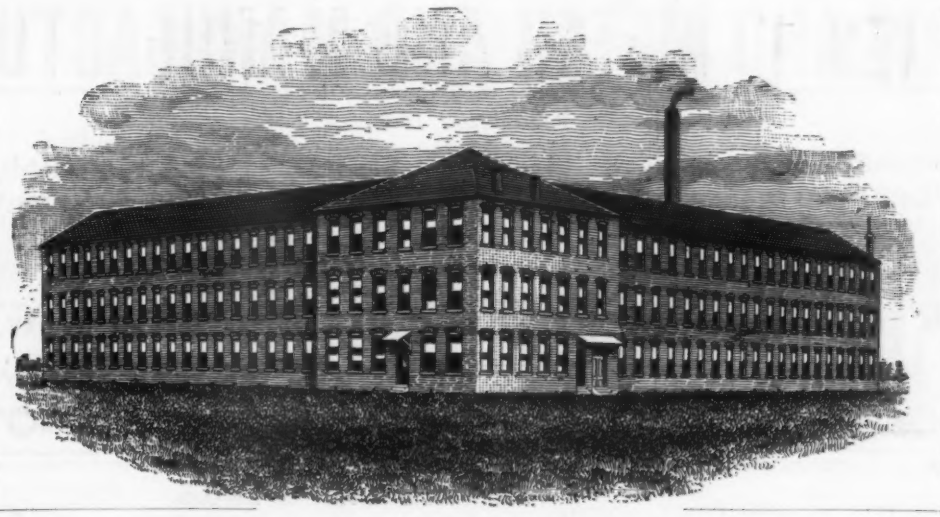
Purifiers, Condensers, Scrubbers & Center Valves

SPECIALS, FLANGE PIPE, AND LAMP POSTS.

C. N. PAYNE, Prest.

J. B. WALLACE, Supt.

F. H. PAYNE, Sec. and Treas.



Factory and Office

ERIE, PA.

ESTIMATES FURNISHED ON APPLICATION.

Agency,
McELWAINE-RICHARDS CO.,
62 & 64 W. Maryland St., Indianapolis, Ind.

METRIC METAL CO.,

MANUFACTURERS OF

Dry Gas Meters

FOR ALL KINDS OF SERVICE.

Special Attention Paid to REPAIRING METERS OF ALL MAKES.

G. M. WITHERDEN, Agent.

JOHN J. GRIFFIN & CO.,

Nos. 1513, 1515, 1517 & 1519 Race Street, PHILADELPHIA.
No. 52 Dey Street, NEW YORK. No. 75 North Clinton Street, CHICAGO.

MANUFACTURERS OF

METERS FOR MEASURING GAS

IN ANY VOLUME.

Provers, Gauges, Registers, Etc., Etc.

EXPERIMENTAL APPARATUS FOR QUANTITATIVE AND QUALITATIVE ANALYSIS.

Careful and Prompt Attention paid to Repairing of all kinds of Meters and Apparatus.

Estimates Cheerfully Furnished.

Established 1849.

With the best facilities for manufacturing, is enabled to furnish reliable work and answer orders promptly.

NATHANIEL TUFTS,

153 Franklin St., Boston, Mass.

C. W. HINMAN, - - Manager.

MANUFACTURER OF

DRY GAS METERS.

Station Meters of any Capacity.

Test and Experimental Meters, Pressure Registers, Pressure Gauges.

METER PROVERS, PHOTOMETERS, STREET LANTERNS, ETC., ETC.

Apparatus for the Chemical Testing of Gas and Gas Liquor.

CHARLES E. DICKEY. JAMES B. SMALLWOOD. CHARLES H. DICKEY.

THE MARYLAND METER AND MANUFACTURING CO.

Established 1866.

BALTIMORE, North & Saratoga Sts. **CHICAGO, 122 & 124 Michigan St.**
NEW YORK, 838 Broadway. **SAN FRANCISCO, 221 Front St.**
BOSTON, 92 Water Street, Rooms 21 and 22.

CONSUMERS' & STATION METERS, PRESSURE GAUGES, Etc., Etc.

"Success" and "Perfect" Gas Stoves.

Established 1849.

HARRIS BROS. & CO.,

Twelfth and Brown Streets, Phila., Pa.

Agency, 67 & 69 S. Canal Street, Chicago.

Manufacturers of Wet and Dry Gas Meters,

STATION METERS, METER PROVERS,

EXPERIMENTAL METERS, SHOW OR GLAZED METERS,

Pressure and Vacuum Registers, Gauges, Photometers, Drip and Bell Pumps, Etc., Etc.

PROMPT ATTENTION GIVEN TO ALL ORDERS. METERS THOROUGHLY REPAIRED. ESTIMATES FURNISHED FOR STATION METERS OF ALL SIZES. CORRESPONDENCE SOLICITED.

GAS METERS. GAS METERS. GAS METERS.

WM. N. MILSTED, Prest. and Genl. Supt. WM. H. HOPPER, Vice-Prest. PAUL S. MERRIFIELD, Sec. and Treas.

THE AMERICAN METER CO.

Established 1834. Incorporated 1863.

WET AND DRY GAS METERS. PRESSURE REGISTERS. METER PROVERS.
STATION METERS. PRESSURE & VACUUM REGISTERS. PORTABLE TEST METERS.
EXHAUSTER GOVERNORS. PRESSURE & VACUUM GAUGES. EXPERIMENTAL METERS.
DRY CENTER VALVES. CRESSON GAS REGULATORS. AMMONIA TEST METERS.
GOVERNORS FOR GAS WORKS. MARSLAND WATER METERS. BAR & JET PHOTOMETERS.

Manufactories:
512 West 22d St., N. Y.
Arch & 22d Sts, Phila.

GAS STOVES.
SUGG'S "STANDARD" ARGAND BURNERS,
SUGG'S ILLUMINATING POWER METER,
Wet Meters, with Lizar's "Invariable Measuring" Drum.

Agencies:
380 Main Street, Cincinnati.
125 & 127 S. Clinton Street, Chicago.
810 North Second Street, St. Louis.
222 Sutter Street, San Francisco.

HELME & McILHENNY,

(Established 1848.)

GAS METER MANUFACTURERS,

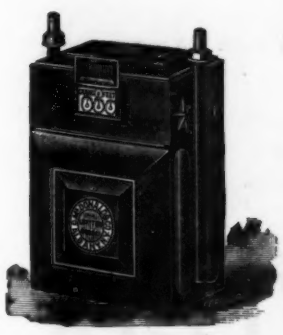
Nos. 1339 to 1349 Cherry Street, Philadelphia, Pa.,

WET AND DRY GAS METERS, STATION METERS, EXPERIMENTAL METERS, METER PROVERS,

Center Seals, Pressure Registers, Governors, Indicators, Photometers, and all other kinds of Apparatus for use in Gas Works

FOULIS' PATENT STATION AND DISTRICT GOVERNORS.

REPAIRING DEPARTMENT.—We employ a special force of skilled workmen repairing meters of **all makers.**



D. McDONALD & CO.,

Established 1854.

154 West 27th Street, NEW YORK CITY.
51, 53 & 55 Lancaster St., ALBANY, N. Y.
34 & 36 W. Monroe St., CHICAGO, ILL.

MANUFACTURERS OF

Wet and Dry Gas Meters

STATION METERS, EXPERIMENTAL METERS, METER PROVERS, PRESSURE & VACUUM REGISTERS & PRESSURE GAUGES.

Meters of all makers Thoroughly Repaired.

A CONVENIENT

BINDER for the JOURNAL.

STRONG.
DURABLE.
LIGHT.
SIMPLE
CHEAP.
HANDSOME.
Price, $1.

A.M. Callender & Co., 32 Pine st., N.Y. City

The American Gas Engineer and Superintendent's Handbook.

By WM. MOONEY.

350 Pages, Full Gilt Morocco. Price. $3.00.

A. M. CALLENDER & CO., 32 Pine St., N. Y.

W. WALLACE GOODWIN, Prest. CALEB G. RIDGWAY, Vice-Prest. & Treas. CHARLES PAIST, Sec. H. B. GOODWIN, Supt. & Gen'l Mangr.

THE GOODWIN METER CO.,

1012, 1014 & 1016 Filbert Street, Philadelphia, Pa.

Agent, GEORGE B. EDWARDS, 113 Chambers Street, N. Y. City.

SOLE MANUFACTURERS OF THE

"Sun Dial" Gas Stoves,

IN A GREAT VARIETY OF STYLES AND SIZES.

Gas Cooking Stove No. 7 C.

The Most Economical, Efficient, and Durable Gas Stove Made.

SIZE.

Stove.	*Oven.*	*Broiler.*	*Top.*
31 inches high.	9¼ inches high.	10 inches high.	21 inches high.
17 inches wide.	15 inches wide.	15 inches wide.	16 inches wide.
	12¼ inches deep.	12¼ inches deep.	

Length over extension shelves, 32 inches.

This Stove has three Boiling Burners in the Top or Hot Plate, and single Oven Burner.

The consumption of this Stove is 35 cubic feet per hour, at 1½ inch pressure with all burners.

Three-eighth inch supply pipe should be used when the pressure is 1½ inches or over.

ALL FITTINGS ARE NICKEL PLATED.

Catalogue showing Styles and Prices sent free on application.

DRY and WET GAS METERS

Station Meters (square, cylindrical, or in staves), Glazed Meters, King's and Sugg's Experimental Meters, Lamp Post Meters, etc., etc.

METER PROVERS (Sizes 2, 5 and 10 feet.)

Pressure Gauges of all kinds, Pressure Registers, Pressure and Vacuum Registers, Pressure Indicators (sizes 4, 6 and 9 in.), King's Pressure & Vacuum Gauges.

DRY & WET CENTER SEALS, DRY & WET GOVERNORS, EXHAUSTER GOVERNORS.

Photometers of all descriptions. Letheby's Sulphur and Ammonia Test Apparatus Complete.

Also, TESTING AND CHEMICAL APPARATUS OF ALL KINDS, AND OF THE MOST PERFECT DESCRIPTION, FOR ALL PURPOSES RELATING TO GAS.

GOODWIN'S IMPROVED LOWE'S JET PHOTOMETER.

Special attention to repairs of Meters and all Apparatus connected with the business. All work guaranteed first-class in every particular. Orders filled promptly.